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THE AUTOMOBILE

Care and Repair of Tires

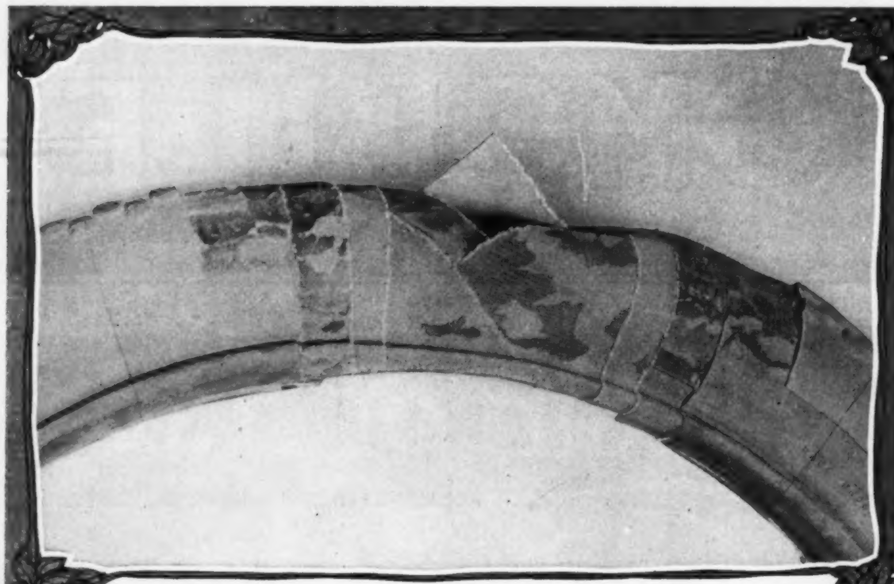
Stripping Outside Rubber for a Complete Retread

Ripping Off Inside Layer of Canvas

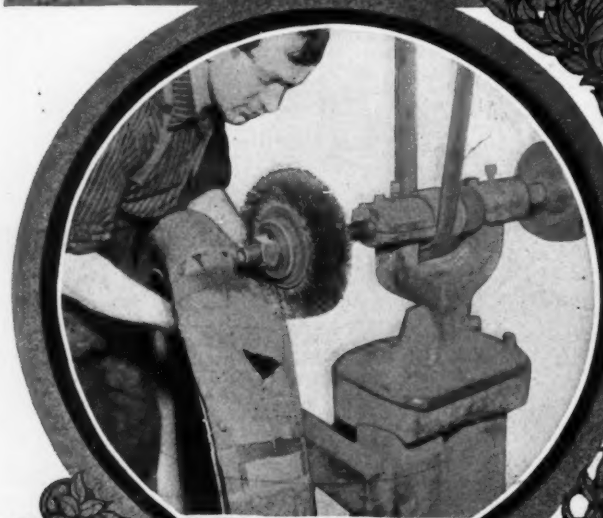
Stripping Canvas from Section to be Repaired

UNLESS some genius with an inventive mind will come to the rescue of the automobile business with a type of wheel that will commercially supplant rubber tires, assuming that tire makers are doing the best that they can, it is much to be feared that the statement of a man high up in the automobile business is founded on truth. This keen visioned man of automobile affairs said: "Counting cost in the long run, the automobile is the tail and the tire is the dog; the question is, Will the tail wag the dog?" If the right kind of a man with a creative mind that succeeds in commercializing the kind of a wheel that will not depend for its efficacy upon pneumatic tires, the tail will not have to wag the dog—it can be cut off.

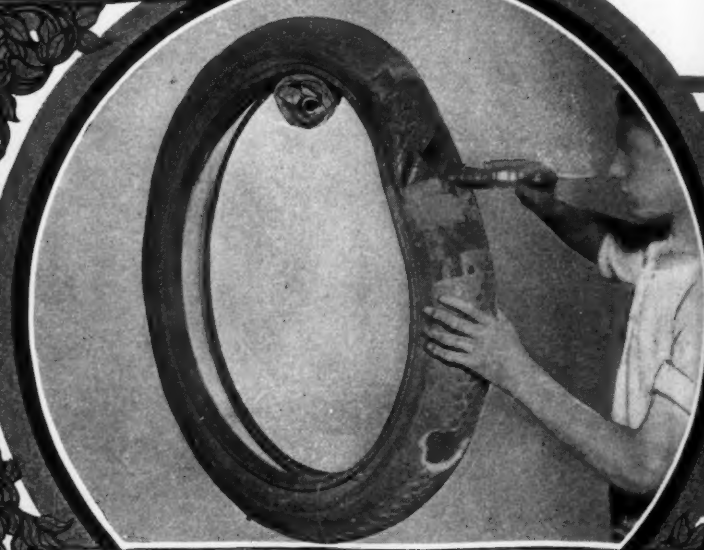
Automobilists are not in a position to await the coming of the "Wellington" who is to give battle and subdue the "Napoleon" who is perched so conspicuously upon the throne of the automobile empire; their needs are immediate and pressing; millions of dollars' worth of automobiles are in daily use and more millions of dollars' worth of tires must be kept in a state of good repair in order that their life may be conserved for the greatest possible length



D—Section to be retreaded showing different layers to be filled up to



E—Buffing bad places before rebuilding



F—Solutioning part to be repaired

G—Roughing up tire before solutioning

of time in the face of great discouragement.

If it is true that tires, as they are now made, are up to the highest obtainable standard in point of material and workmanship, then, in the absence of something better, it devolves upon automobilists to make up the deficit, interjecting the requisite measure of caution and care in order that when the balance is struck the cost of maintenance of the automobile, as a whole, will not exceed the value of the advantages derived from its use.

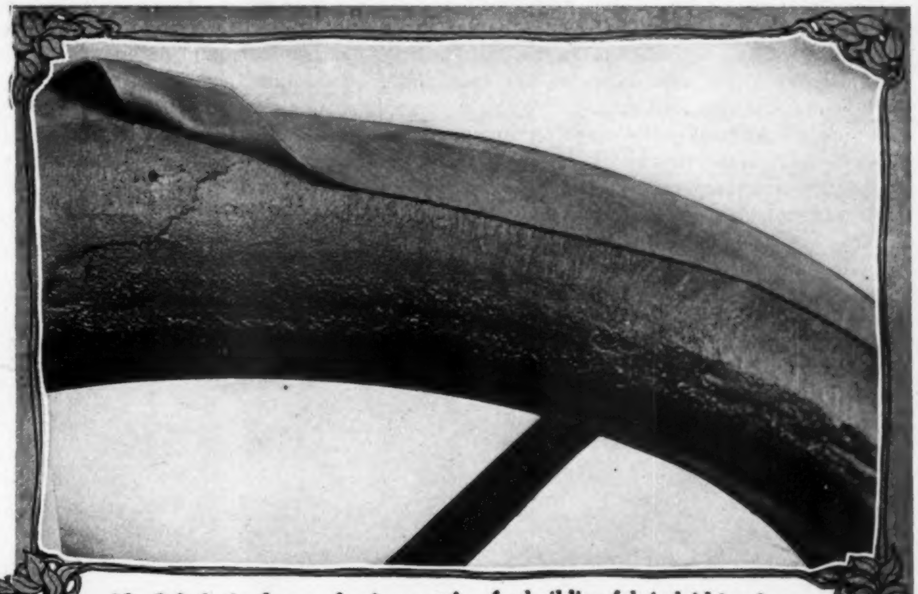
The immediate and pressing need, in view of all the circumstances, is coupled with the care and repair of tires. Were an autoist to be told that he does not realize the seriousness of the situation, he would scoff at the bearer of such stale news, but the fact remains that the editor of The Automobile stood on the corner of Forty-second street and Fifth avenue for just one hour on October 20, during the passing of 46 automobiles, 29 of which were running on pneumatic tires that were not in a good state of repair.

Of the 29 automobiles referred to, 24 of them were driven by chauffeurs, and the conclusion reached, after considering this phase of the situation, was that automobilists who drive their own cars do pay some attention to the care and repair of tires, but that chauffeurs are more interested in collecting the commission on new tires than they are

in prolonging the life of the tires in use.

"An ounce of prevention is worth a pound of cure." This old and trite saying never applied to anything with such great soundness as it does to the tire problem. This being so, the first move in the application of the principle demands the instant dismissal of the chauffeur who is not satisfied with his position and his salary, and who fastens his fangs upon the man who employs him, aided and abetted by the tire vendor who is so lacking in business acumen and common honesty as to put himself and his business under the shadow of a crime.

In talking about the tire problem to an automobilist who keeps several cars in commission, he related an incident that bears fittingly upon the points that are here to be made, when he said: "My chauffeur when he brought me to the office this morning asked me for permission to take the car up to his place of abode in upper Harlem in order that he could attend to one of his private affairs. I refused him permission to do so and pointed out that it was far cheaper for him to take a trolley car, leaving my automobile in the garage. He did not seem to appreciate the fact that a menacing tire bill, under the best of conditions, is increased by every foot that an automobile makes; he was spending my money which made a great difference with him."



H—Solutionized cover having a strip of rebuilding fabric laid in place

J—Semi-cure process using a band press system

I—Laying four-ply unvulcanized gum on part to be repaired

K—Inserting coil spring before wrapping

The owner of an automobile who supports a chauffeur if he declines to have his automobile worn out in the service of his majestic employee is dubbed a "tight wad." Some owners are so thin-skinned that they wince at the appellation, overlooking the advantage derived, forgetting, for the moment, that a "tight wad" prefers to employ the character of chauffeur that is satisfied with an honest living and insists upon having his tires maintained in a state of good repair, and being wise, makes his own purchases, not only of real estate, but of tires as well.

Every business man knows that there are grades in quality of every commodity, and there is no reason for believing that tires are an exception to this rule. The first principle involved in the purchase of anything demands that the purchaser represent himself, but if there are reasons why he cannot do so, the second principle demands that he appoint an honest agent.

It is necessary to consider all these preliminary attending features in the discussion of the care and repair of tires for reasons as follows:

(A) Superior grades of tires will last the longest in a given service.

(B) If repairing is neglected more or less, the better the quality of the tires, the less marked the effect of abuse will be.

(C) The efficacy of repair depends absolutely upon the quality of material of which the tire is made.

(D) If the fabric of the tire is inferior, a "blow-out" will result and patching a tire that is so poor that it will blow out is a futile undertaking.

(E) If the rubber compound is lacking in cementing qualities, it is useless to try to make a repair, since the new work will not adhere to the old.

In measuring the value of prompt and skillful repair work, in view of the above considerations, the first real effort in the direction of repairing comes in the purchase of the tires. If the price lists are all alike, and the discounts are identical, it remains to discriminate between the different grades of tires and purchase the kind that will (a) last the longest in a given service and (b) submit to the repairman's manipulations most efficaciously.

Having purchased tires that will last the longest in the first place, and lend themselves to repairing operations with greatest facility, the real questions of maintenance must then be coped with, and in view of the cost of tire maintenance, the same discriminating care that is given the watch in the automobilist's pocket will bring an equal measure of result with the tires.

Remembering that destructive wear comes with increasing speed rather than with the weight that has to be borne by the tires, considering also that the road condition has a marked effect for good or ill, it remains to defer the day of necessary repairing in the ways as follows:

(A) By using the automobile as sparingly as possible, traveling the long way around rather than by short cuts, if good road conditions can be so had.

(B) By keeping the speed of the automobile down to reasonable limits at all times, remembering that the wear and tear will be multiplied by four if the speed is doubled; in other words, whatever the wear and tear might be at 20 miles per hour, it will be four times that amount at 40 miles per hour.

(C) By watching the road condition rather than to maintain some predetermined speed as measured by the speedometer.

(D) By driving slowly when the going is rough, dropping down to low gear when the top dressing of the roadway is covered with loose broken stone.

(E) By remembering that the way to cut rubber is to wet it, not forgetting that sharp stones will cut the rubber thread of the tires with relative ease on a wet day.

(F) By keeping the tires fully inflated, with never a fear of overinflation, due to any effort that can be brought to bear, through the use of a hand pump and the exertion of an autoist.

(G) By keeping out of car tracks (absolutely), with never a thought of treading into frogs and crossings under any circumstances—the frayed-out metal at these points is extremely sharp and will cut like a razor.

(H) By remembering that "flywheel effect" has a pronounced bearing upon tire life—the larger the diameter of the road wheel and the faster it travels the greater will be the flywheel effect.

(I) By going around corners slow enough to prevent skidding.

(J) By applying the brakes gradually.

(K) By letting in the clutch softly.

(L) By maintaining correct parallelism of the road wheels.

(M) By disregarding what the pressure gauge says, if the respective tires indicate that they are not equally blown up—the same roundness of section should obtain for each tire at the point of road contact.

(N) By substituting larger section tires, if those in use will not carry the load without showing flexure when they are fully inflated—no amount of pressure will suffice to make the tires stand up under the work if they are too small.

(O) By washing the tires with tepid water, rendered soft by castile soap, every time the car comes in off the road and inspecting the tread at every point, looking for cuts or abrasions, with the understanding that they will be fixed before further use.

(P) By keeping the garage floor scrupulously clean, with especial reference to lubricating oil, making sure that no lubricating oil whatever is permitted to remain on the tires.

(Q) By protecting the tires from applications of gasoline or other hydrocarbon fuel.

(R) By removing the tires at reasonable intervals and cleaning the rims, after which re-enamel them, thus preventing rust formations from attacking the fabric.

(S) By making sure that the inner tubes are of the right size.

(T) By guarding against kinking or overlapping of the inner tubes.

(U) By adjusting the clips so that they will not bite the inner tubes.

(V) By using talcum copiously as a tire lubricant, making sure that every portion of the surface of the inner tube is well coated over.

(W) By scrutinizing the inner walls of the outer casing and removing every rough zone, taking particular notice as to whether or not nails or other puncture producers are not projecting through ready to puncture every inner tube that is put into place.

(X) By exercising care in putting on tires, making sure that the tire irons do not bruise the inner tubes and fray the beading of the outer casings.

(Y) By keeping the tires out of direct sunlight, away from dry steam heating and in a cool, well ventilated room under conditions of subdued lighting—when on the road if the car must stand for a time select a shaded place.

(Z) By jacking the car up off the floor when it is not in use, thus taking the weight off the tires and letting off a little of the tire pressure, making sure, however, that the car is not rolled around until the tires are fully inflated again.

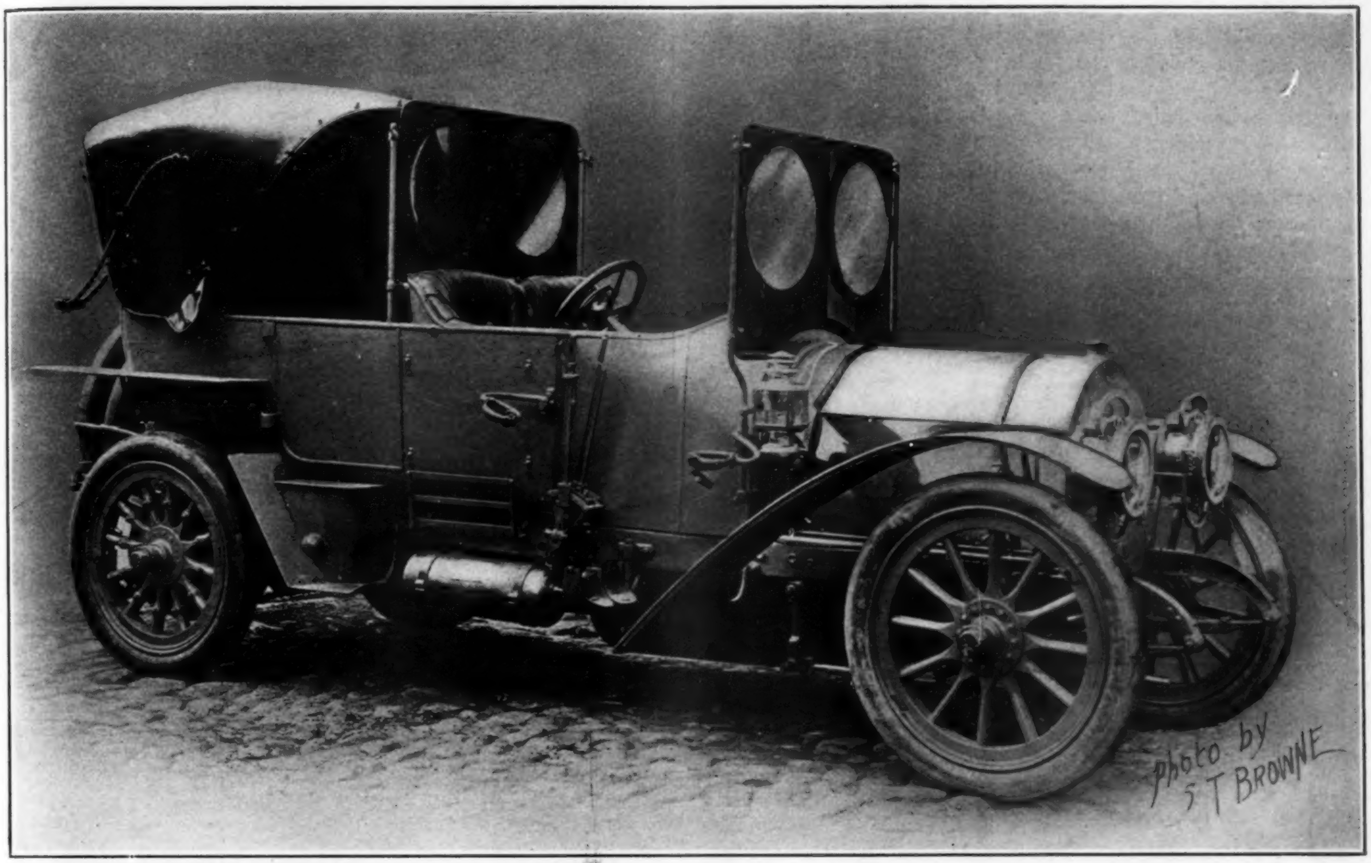
Copy the Professional in Making Repairs

Having exercised every precaution as above set down, taking advantage of experience, not relying upon these suggestions alone, it still remains for the automobilist who proposes to make the best fight he can in the face of adverse conditions to put himself in possession of the best possible information in relation to repair work, copying the methods of the professional up to the limit of unprofessional facilities, making up in added skill and greater care for the absence of the more perfect methods, calling upon the repairman to perform the truly difficult tasks rather than to display the distinguishing characteristics of the penny-wise and pound-foolish.

The series of illustrations that are offered in connection with this article were taken at the Knickerbocker Tire and Repair Company's plant, and depict the methods in vogue in professional repair plants where tires are handled in a large way. Each step from A to Z of the whole process is shown, from the healing of a simple wound on the thread of a tire to the stripping of a carcass and rebuilding from the ground up.

Among the Makers

WINTER AUTOMOBILING; MOON CAR FOR 1911; FRANKLIN AIR-COOLED AUTOMOBILES; EXPERIENCES OF A DEEP-SEA HACKMAN, ETC.



THE BODY MAKES THE APPEARANCE OF THE CAR—A ROTHSCHILD STUDY

WINTER automobiling, rather than to put the car out of service, is becoming the regular order of things. There is no longer any reason for desiring to lay up the car for the winter. On the other hand, since the going is naturally the worst when the weather is inclement, it stands to reason that the best work can be done, counting from the viewpoint of real utility, when the snow is on the ground, and the wise owner now saves himself rather than put his automobile out of use at the very time when it will be of the greatest value to him. Just why automobiles are now in fettle to do winter work on a basis that is more in keeping with the needs is difficult to explain, excepting that larger diameter wheels, more power, greater flexibility, superior material, exacting workmanship, and last, but not least, types of body work that protect the occupants from wintry blasts, are important factors. Saving the man rather than the car, is a natural and timely thing to do.

Moon Cars for 1911

MODEL 30 IS RETAINED SUBJECT TO REFINEMENT; MODEL 45 REMAINS THE HIGH-POWERED STANDBY; IMPROVEMENTS ARE MADE ALL ALONG THE LINE

ANNOUNCEMENT is made of the Moon line of automobiles for 1911, and advices from the Moon Motor Car Company, of St. Louis, Mo., lend substance to the understanding that the Moon 1910 automobiles had arrived at a level, from the point of view of standardization, to warrant the company in staking its future upon them, subject to such changes and refinements as an efficient engineering corps at the company's plant would necessarily desire to incorporate remembering that the whole procedure should be by way of an evolution rather than to depart from well-known standards that are giving satisfaction, hoping, perchance, that something new and untried will accomplish that which has never been done before.

The Model 30 car is offered to the Moon clientèle with five body options, as shown in the tabulation, with prices ranging from $1,500 for the Touring Car, and Toy Tonneau, as well as the Roadster, to $2,750 for the Landau, with a Coupé intervening at $2,250.

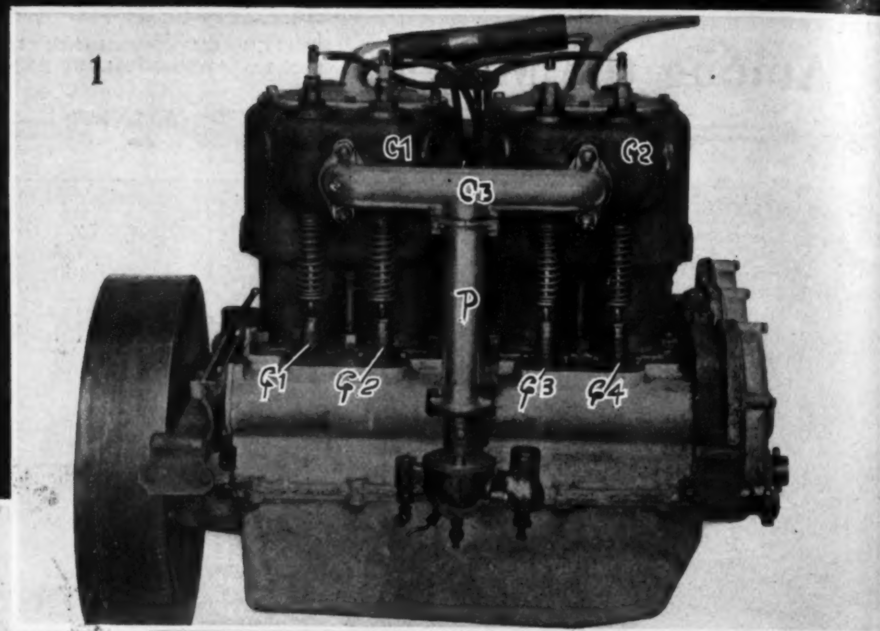
The Model 45 car is offered in five options, including the

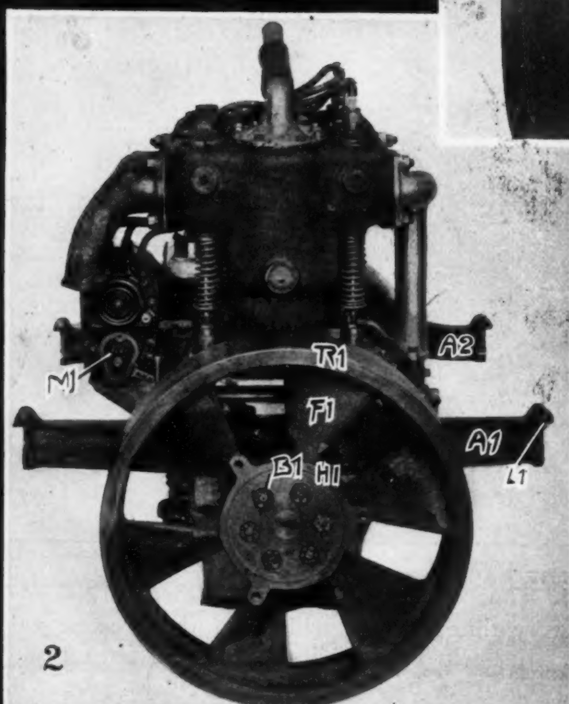
Touring and Toy Tonneau at the same price, while the foredoor type and Torpedo body cars are priced at $3,100 each, and the Limousine sells at $4,000.

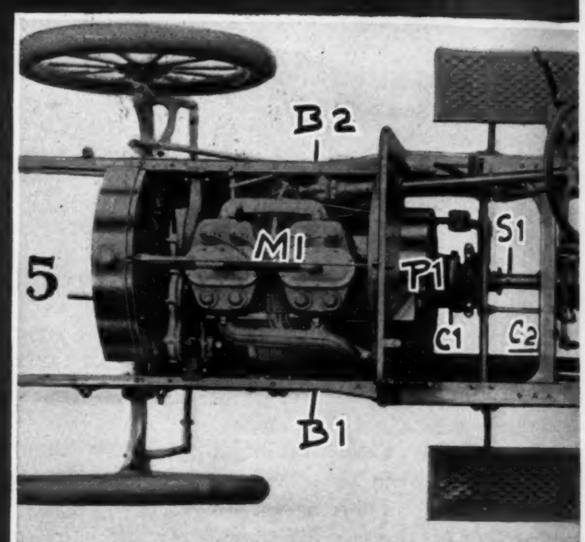
The Model 30 car has 114-inch wheelbase and standard tread, while the Model 45 car has 121-inch wheelbase and standard tread. The approximate weight of the Model 30 car is 2,650 pounds, and the tire equipment is 34 x 3 1-2 inches. The Model 45 car weighs about 3,100 pounds, and the tire equipment is 36 x 4 inches.

The most noticeable improvement in the motor of the Moon "45" is in the method of driving the magneto and water pump. These are now located at right angles to the crankshaft and driven with one gear off the vertical camshaft. This change has allowed the discontinuance of the pump gears formerly employed. The lubricating system has been retained in precisely the same arrangement as on former models for the past four years, the crankshaft being drilled as heretofore. The force feed lubricator, instead of being located on the dash and driven by an extension of the camshaft, is now operated by two spiral gears, which leaves the dash perfectly plain, except for the single sight feed. The exhaust manifold has been remodeled so as to leave fewer bends and angles to impede the progress of the exhaust gases.

One most noticeable change is the method of drive and rear spring sus-







SPECIFICATIONS FOR MOON

MODELS	Price	H.P.A.L.A.M.	BODY Type	BODY Seats	MOTOR Cyls.	MOTOR Bore Inches	MOTOR Stroke Inches	MOTOR Cyl. Cast.	COOLING Radiator	COOLING Pump	IGNITION Magneto	IGNITION Battery	Lubrication
Moon 30	$1500	28.9	Tour'g.	5	4	$4\frac{1}{4}$	5	Pairs.	Tubular.	Cent'fl.	Remy	Dry	Splash
Moon 30	1500	28.9	T. Ton.	4	4	$4\frac{1}{4}$	5	Pairs.	Tubular.	Cent'fl.	Remy	Dry	Splash
Moon 30	2750	28.9	Limous.	7	4	$4\frac{1}{4}$	5	Pairs.	Tubular.	Cent'fl.	Remy	Dry	Splash
Moon 30	1500	28.9	R'ster.	3	4	$4\frac{1}{4}$	5	Pairs.	Tubular.	Cent'fl.	Remy	Dry	Splash
Moon 30	2250	28.9	Coupe	3	4	$4\frac{1}{4}$	5	Pairs.	Tubular.	Cent'fl.	Remy	Dry	Splash
Moon 45	3000	36.1	Tour'g.	7	4	$4\frac{1}{2}$	5	Pairs.	H'comb.	Cent'fl.	Bosch	Dry	Mech.
Moon 45	3000	36.1	T. Ton.	5	4	$4\frac{1}{2}$	5	Pairs.	H'comb.	Cent'fl.	Bosch	Dry	Mech.
Moon 45	4000	36.1	Limous.	7	4	$4\frac{1}{2}$	5	Pairs.	H'comb.	Cent'fl.	Bosch	Dry	Mech.
Moon 45	3100	36.1	F. door.	7	4	$4\frac{1}{2}$	5	Pairs.	H'comb.	Cent'fl.	Bosch	Dry	Mech.
Moon 45	3100	36.1	Torp'o.	4	4	$4\frac{1}{2}$	5	Pairs.	H'comb.	Cent'fl.	Bosch	Dry	Mech.

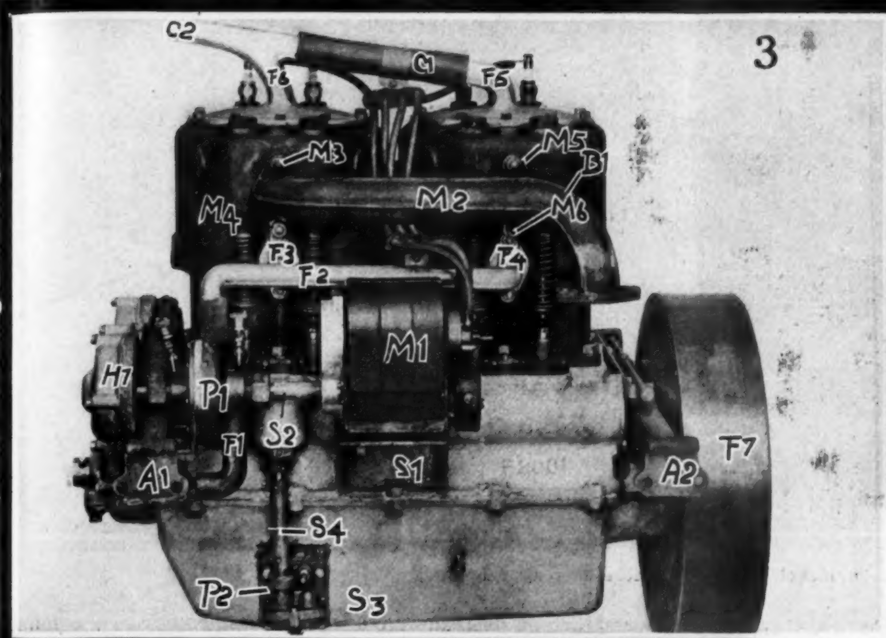
Fig. 1—Right Hand Side of the Model 30 Motor, Showing the Location of the Schebler Carbureter.

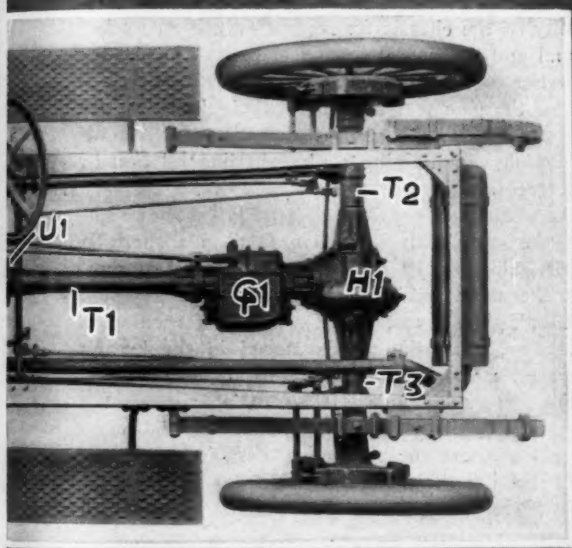
Fig. 2—Rear End View of the 30 Motor, Showing the Fan in the Flywheel.

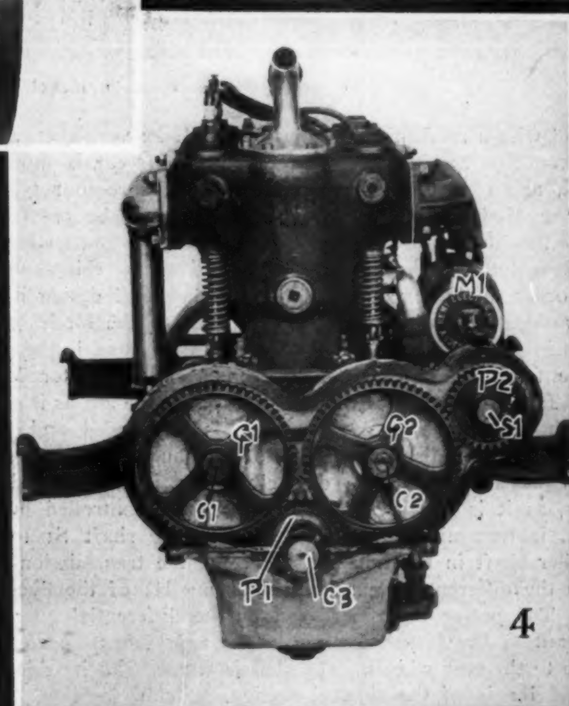
Fig. 5—Model 30 Stripped Chassis.

pension. Three-quarter springs are used in the rear instead of full elliptic as before, and the axle drive is direct through them to the frame, doing away entirely with the drive rods and the familiar V-type of drive with the ball and socket, which was so long a Moon characteristic. The muffler is no longer carried on the rear of the frame, but is hung longitudinally underneath the body. A dust shield takes its place in the rear.

The touring car bodies for the "45" have been given two inches more room in the tonneau and the entire tendency has been in a modification of both the straight line and convex







CARS AS OFFERED FOR 1911

Clutch	TRANSMISSION Type	Speeds	Location	Drive	Wheelbase	Tread	Frame	BEARINGS Crankshaft	Trans-mis'n	Axle	Weight, lbs.	TIRE Front	Rear
M'l. disc.	Selecti'e.	3	Axle...	Shaft...	114	56	P. Steel..	Plain...	Roller...	Roller...	?650	34x3½	34x3½
M'l. disc.	Selecti'e.	3	Axle...	Shaft...	114	56	P. Steel..	Plain...	Roller...	Roller...	2650	34x3½	34x3½
M'l. disc.	Selecti'e.	3	Axle...	Shaft...	114	56	P. Steel..	Plain...	Roller...	Roller...	2650	34x3½	34x4
M'l. disc.	Selecti'e.	3	Axle...	Shaft...	114	56	P. Steel..	Plain...	Roller...	Roller...	2650	34x3½	34x3½
M'l. disc.	Selecti'e.	3	Axle...	Shaft...	114	56	P. Steel..	Plain...	Roller...	Roller...	2650	34x3½	34x3½
M'l. disc.	Selecti'e.	4	Amid....	Shaft...	121	56	P. Steel..	Plain...	Plain...	Ball....	3100	36x4	36x4½
M'l. disc.	Selecti'e.	4	Amid....	Shaft...	121	56	P. Steel..	Plain...	Plain...	Ball....	3100	36x4	36x4
M'l. disc.	Selecti'e.	4	Amid....	Shaft...	121	56	P. Steel..	Plain...	Plain...	Ball....	3100	36x4	36x4½
M'l. disc.	Selecti'e.	4	Amid....	Shaft...	121	56	P. Steel..	Plain...	Plain...	Ball....	3100	36x4	36x4½
M'l. disc.	Selecti'e.	4	Amid....	Shaft...	121	56	P. Steel..	Plain...	Plain...	Ball....	3100	36x4	36x4

Fig. 3—Left Hand Side of the Model 30 Motor, Showing the Magneto, Water, and Oil Pump.

Fig. 4—Front End View of the 30 Motor, with the Half-time Gearcase Open, Showing Details.

type. Fore-door bodies and torpedoes have been added to the selection of bodies.

Jump spark ignition is employed, with dry cells and a Remy magneto used in dual combination with a single unit coil and a single set of spark plugs.

In the Model 30 car ignition is by Remy magneto, with a coil and dry cell auxiliary, whereas in the Model 45 car the ignition is by Bosch magneto, using a dry battery for the secondary source of electrical energy. Both types of motors are water-cooled with a centrifugal pump for circulating the water, and the radiator of the Model 30 is of the tubular type, whereas the radiator of the Model 45 is of the honeycomb type. Lubrication is by splash in the Model

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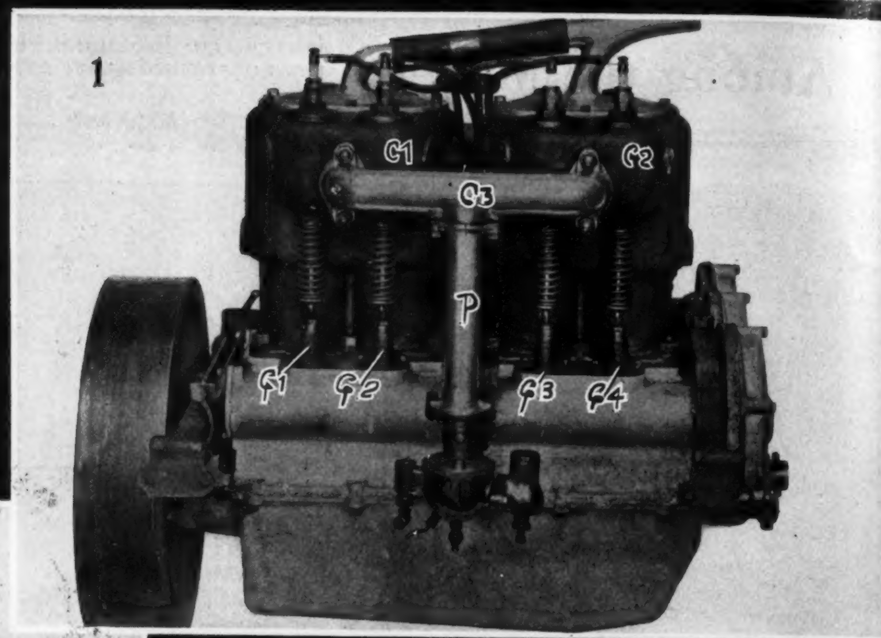

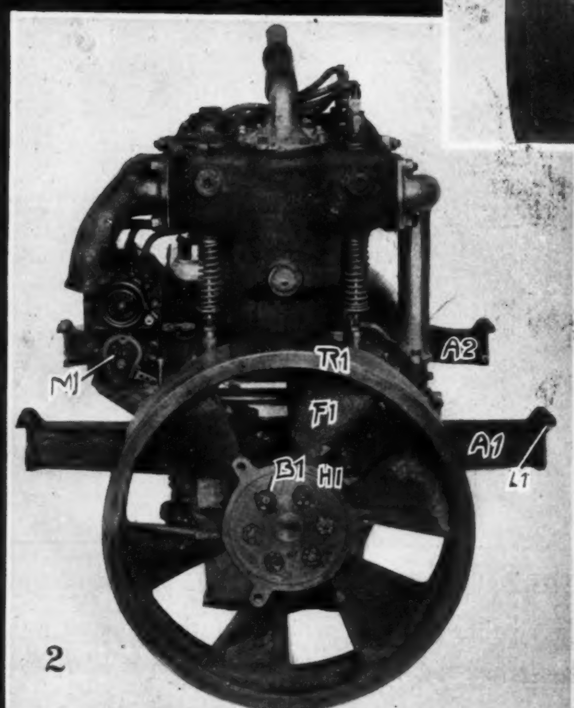

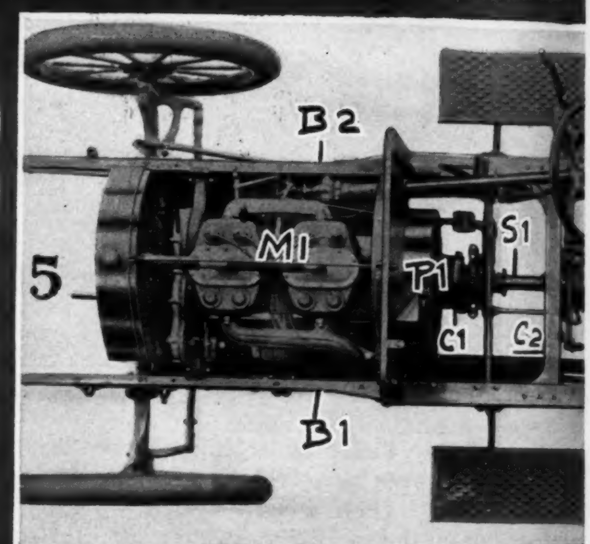

SPECIFICATIONS FOR MOON

MODELS	Price	H.P.A.L.A.M.	BODY Type	Seats	MOTOR Cyls.	Bore Inches	Stroke Inches	Cyl. Cast.	COOLING Radiator	Pump	IGNITION Magneto	Battery	Lubrication
Moon 30........	$1500..	28.9..	Tour'g..	5	4	$4\frac{1}{4}$	5	Pairs..	Tubular.	Cent'fl...	Remy...	Dry.....	Splash..
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Moon 30........	2750..	28.9..	Limous.	7	4	$4\frac{1}{4}$	5	Pairs..	Tubular.	Cent'fl,..	Remy...	Dry.....	Splash .
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Moon 45........	4000..	36.1..	Limous.	7	4	$4\frac{3}{4}$	5	Pairs..	H'comb..	Cent'fl...	Bosch...	Dry.....	Mech ..
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Jump spark ignition is employed, with dry cells and a Remy magneto used in dual combination with a single unit coil and a single set of spark plugs.

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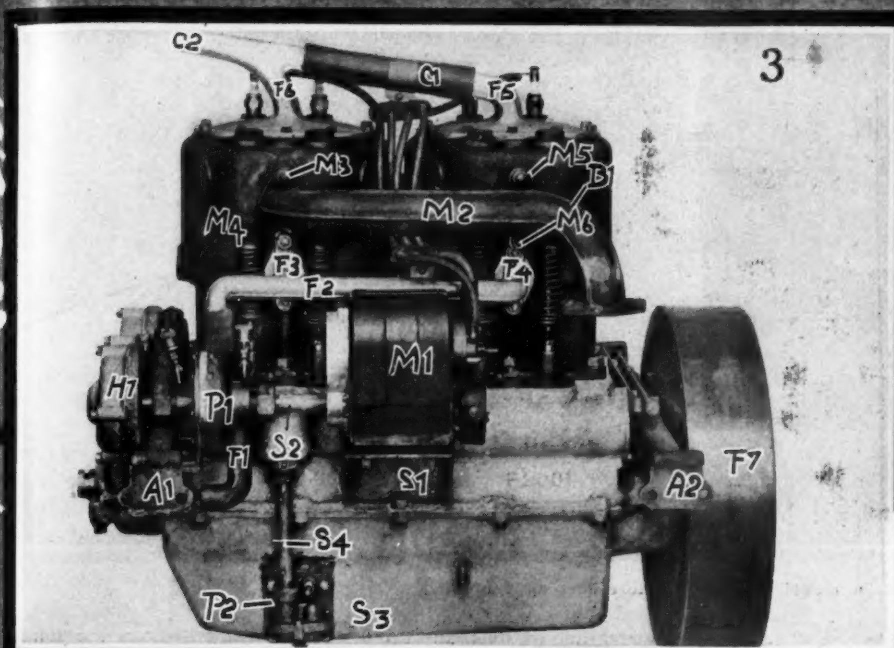
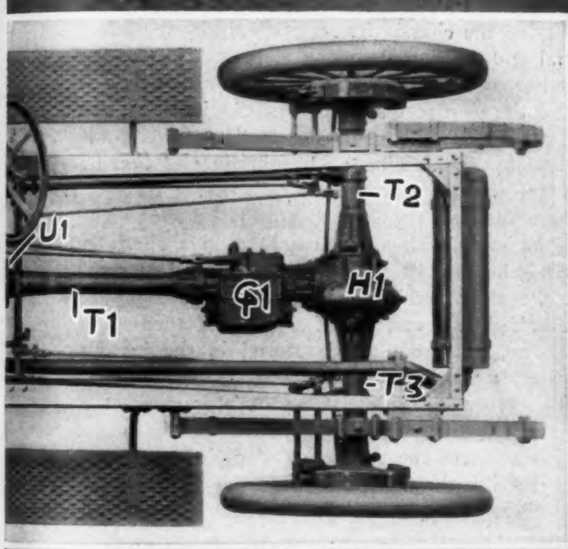
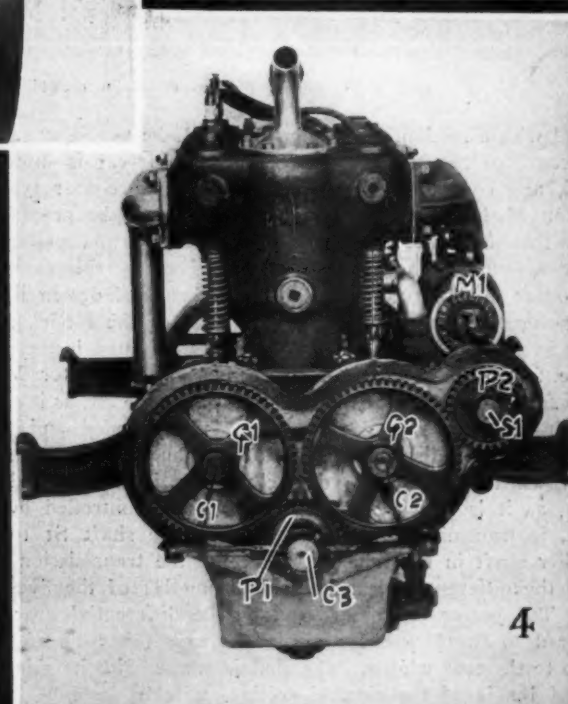






CARS AS OFFERED FOR 1911

Clutch	TRANSMISSION Type	Speeds	Location	Drive	Wheelbase	Tread	Frame	BEARINGS Crank-shaft	Trans-mis'n	Axle	Weight, lbs.	TIRE Front	Rear
M'l. disc.	Selecti'e.	3	Axle...	Shaft...	114	56	P. Steel..	Plain...	Roller...	Roller...	2650	34x3½	34x3½
M'l. disc.	Selecti'e.	3	Axle...	Shaft...	114	56	P. Steel..	Plain...	Roller...	Roller...	2650	34x3½	34x3½
M'l. disc.	Selecti'e.	3	Axle...	Shaft...	114	56	P. Steel..	Plain...	Roller...	Roller...	2650	34x3½	34x4
M'l. disc.	Selecti'e.	3	Axle...	Shaft...	114	56	P. Steel..	Plain...	Roller...	Roller...	2650	34x3½	34x3½
M'l. disc.	Selecti'e.	3	Axle...	Shaft...	114	56	P. Steel..	Plain...	Roller...	Roller...	2650	34x3½	34x3½
M'l. disc.	Selecti'e.	4	Amid....	Shaft...	121	56	P. Steel..	Plain...	Plain...	Ball....	3100	36x4	36x4½
M'l. disc.	Selecti'e.	4	Amid....	Shaft...	121	56	P. Steel..	Plain...	Plain...	Ball....	3100	36x4	36x4
M'l. disc.	Selecti'e.	4	Amid....	Shaft...	121	56	P. Steel..	Plain...	Plain...	Ball....	3100	36x4	36x4½
M'l. disc.	Selecti'e.	4	Amid....	Shaft...	121	56	P. Steel..	Plain...	Plain...	Ball....	3100	36x4	36x4½
M'l. disc.	Selecti'e.	4	Amid....	Shaft...	121	56	P. Steel..	Plain...	Plain...	Ball....	3100	36x4	36x4

Fig. 3—Left Hand Side of the Model 30 Motor, Showing the Magneto, Water, and Oil Pump.

Fig. 4—Front End View of the 30 Motor, with the Half-time Gearcase Open, Showing Details.

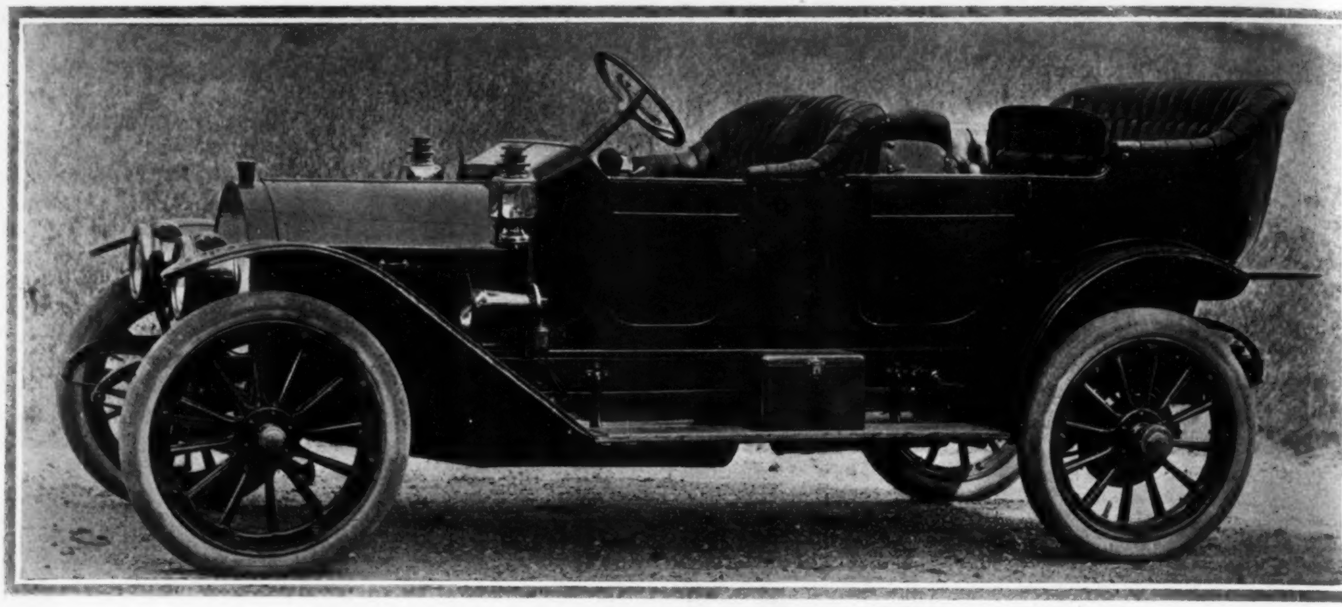


Fig. 6—Moon model 45 with the fore-door type of body

30, and with a mechanical system in the Model 45. The general appearance of the Model 45 fore-door type of car is shown in Fig. 6, and comparing this model with the fore-door type of body on Model 30, as shown in Fig. 7, it will be possible to realize that there is a certain standard of design and appearance that is maintained throughout the work done by this company.

In order to understand the general scheme of design it will be feasible to examine the stripped chassis of the Model 30, as shown in Fig. 5, in which the radiator R1 is located in the plane of the front axle, and the four-cylinder T-type motor M1 is placed far enough back of the radiator so that the air, as it passes through the interstices of the same, is unimpeded and flows down, due to the displacing action of the fan in the flywheel F1 within which the multiple disc clutch C1 is nested, and the power, as it is delivered by the motor, and controlled by the clutch, is transmitted therefrom through the shaft S1 to the propeller shaft in the tube T1, thence to the transmission gear G1 to the differential gear in the housing H1 of the live rear axle. The power is weighed out by the differential gear and delivered to the jackshafts within the axle tubes T2 and T3, thence to the rear wheels. The chassis frame, with its side bars B1 and B2, is of the channel section, suitably fashioned of a proper grade of steel, and the flanges are widened from the point of narrowing at the dash, tapering off toward the back, thus affording strength where it is most needed. While it is the aim to secure great rigidity of the chassis frame, not only by the selection of the material and the liberal section employed, but by the use of a substantial cross bar C2, and at the point of support of the motor, it is also the plan to maintain great flexibility of the relating members, partly by the use of a well-contrived universal joint U1, and by maintaining a straight line relation of the members and true turning centers.

Referring to the motor of the Model 30, Fig. 3 shows the left-hand side of the same with a magneto M1 on a shelf S1 back of the centrifugal pump P1 with a shaft S2 used in common for driving, the same receiving its power from a pinion in mesh with the half-time gears, all of which are encased in the housing H1. The lubricating oil is stored in the bottom half of the crankcase S3, and is circulated by means of the pump P2, the latter being driven by the shaft S4. Water enters the centrifugal pump through the fitting F1, and leaving the pump through the fitting F2 enters the two pairs of cylinders at the flanges F3 and F4, leaving the cylinders at the top through the fittings F5 and F6, there being a flexible connection C1 between

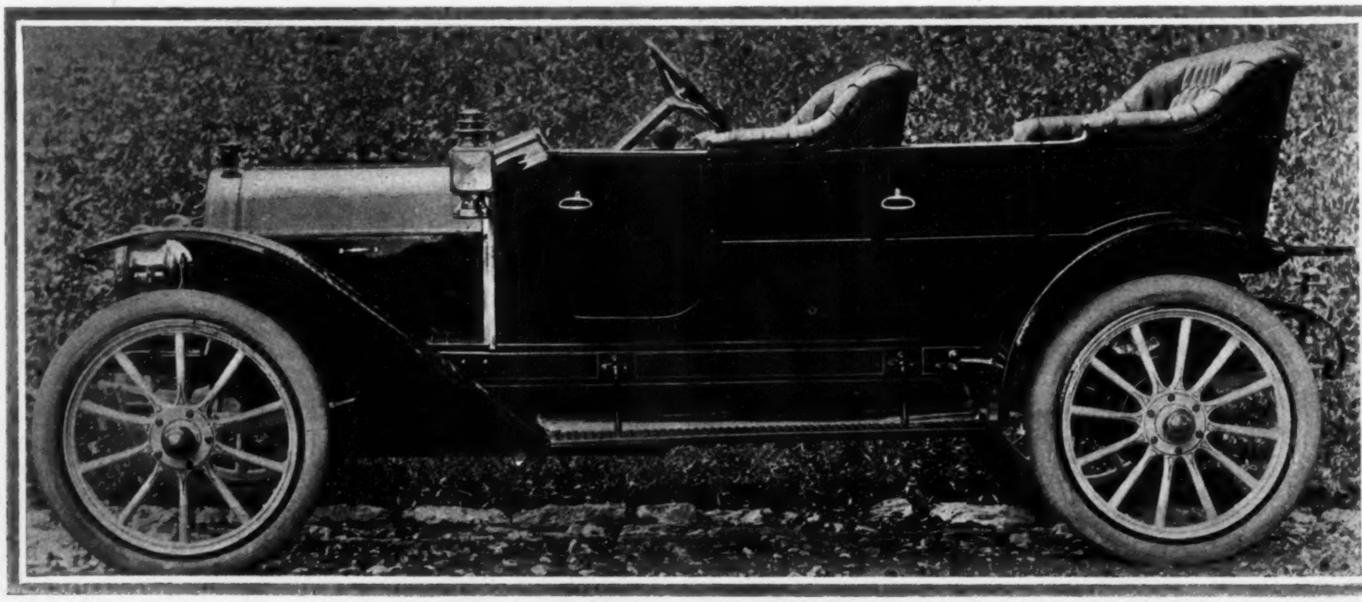


Fig. 7—Model 30 with the fore-door type of body

the fittings, and a second flexible connection C2 at the junction of the fitting F6, and the fitting leads to the radiator. The exhaust manifold M2 is shaped with an easy bend B1, and is so designed that the fastenings M3, M4, M5 and M6 are readily gotten at for purposes of assembling, tightening up, or disassembling. The flywheel F7 is of large diameter, and it is properly marked off, so that the autoist may check the timing of the motor at will, and the motor is suspended on the chassis frame by means of drop-forged arms A1 and A2, so that the weight of the motor and the gyrations of the flywheel are adequately cared for, without stressing the metal of the crankcase.

Glancing at the right-hand side of the motor, as shown in Fig. 1, it will be observed that the carbureter C1, of the Schebler type, is in an accessible position, remote from the sparking equipment, and is connected to the two pairs of cylinders C1 and C2 by a standpipe P1 and a cross-connection C3. This side of the motor shows the valve mechanism clearly, and the guides G1, G2, G3 and G4 are designed to afford a long bearing, maintain the right relation of the parts, and perform noiselessly. This being the intake side of the motor, the spark plugs are located herein, coming just above the intake valves.

Referring to Fig. 4 of the front end of the motor, the half-time gears G1 and G2 are keyed onto the cam shafts C1 and C2, and are driven by the pinion P1, which is keyed onto the crankshaft C3. The magneto M1 is driven by the pinion P2 through the shaft S1, taking its power from the gear G2.

The rear end of the "30" motor is shown in Fig. 2, bringing into view the fan blades F1, of which there are six, joining the flywheel rim R1 to the clutch housing H1, showing the six bolts B1, by means of which the flywheel is flanged to the crankshaft.

This illustration also shows the accessibility of the magneto M1, and affords a better view of the drop-forged I-section cross-arms that serve as a support for the motor, they being fastened to the chassis frame with overhanging lips L1, so that the load is carried in shear by the section, and the holding bolts are relieved of this responsibility.

There are many other nice ramifications that might be studied in connection with the Moon models, some of which, however, can only be brought out by an examination of the working drawings, or if the cars are inspected. The tabulation given enumerates the remaining general characteristics not herein discussed.

Franklin Product and Practices

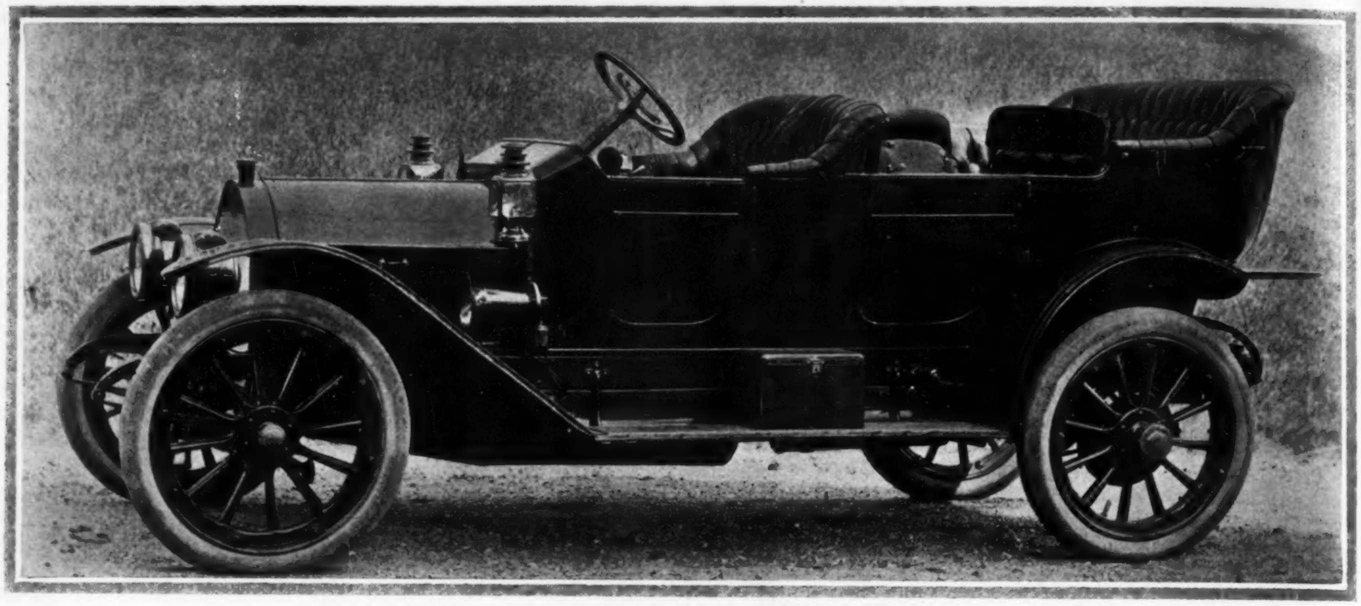
AIR-COOLED MOTOR AND ACCESSORIES; DEPICTING METHODS OF MANUFACTURE; TREND IN AIR-COOLED MOTOR WORK

UNUSUAL interest is centered in the methods in vogue in the plant of the H. H. Franklin Manufacturing Company, of Syracuse, N. Y., due to its close adherence to a definite standard, with its attending and unqualified success. This plant has been devoted to the manufacture of air-cooled motors from its inception; it has never departed from its chosen class of work, and the evolution of the air-cooled motor in America will be best appreciated by observing the refinements which will be found in the 1911 Franklin motors, and studying the methods of manufacture simultaneously. The output of the plant for the immediate future will comprise four models in the line of open cars, two of which will be equipped with six-cylinder motors, and the remaining models will have four-cylinder motors. These models are known in the Franklin literature as H, D, M and G, and their horsepower ratings are 48, 38, 25 and 18, respectively.

The six-cylinder type of motor, as will be found in models H and D, is depicted in Fig. 13, showing the motor with its cylinders, C1, C2, C3, C4, C5 and C6, of the air-cooled type with vertically disposed flat steel gills, surrounded by air jackets, left open at the top and bottom so that the cooling air is drawn in over the hottest zones at the top of the respective cylinders and passes down in equal quantity for each cylinder, sweeping over the surfaces of the gills, passing out by way of the squirrel cage air propeller P1, as shown in Fig. 17. A more precise detail of the design of the cylinders will be found in Fig. 14, presenting two of the cylinders of the four-cylinder motor during the process of erection. Referring back to Fig. 13 of the exhaust side of the motor, it will be observed that after the air passes into the jackets of the respective cylinders it comes out below into the space surrounding the motor case in the lower extremities of the cylinders, and the arrangement of the partitions P1, P2 and P3 is such that when the bonnet is put on, the same resting on the chassis frame F1, the space below P1 is rendered tight, and all the air that is moved by the propeller as shown in Fig. 17 must pass down through the jackets of the cylinders, and since the openings are equal in point of arc for the respective cylinders, the supply of air is regulated so that each of the cylinders is maintained under constant conditions of cooling. The exhaust manifolds M1 and M2 are connected up so that the exhaust from the cylinders is first into the manifolds M3 and M4, thence to the manifold M1, but when the pistons travel to a point near the bottom of the stroke, the auxiliary valves V1, V2, etc., there being one for each cylinder, are open, and it has been found by test that over 70 per cent. of all the exhaust passes out through these auxiliary valves, thence to the manifold M2, from there to the muffler, through the muffler piping, and away to the atmosphere from the muffler. Observation leads to the definite conclusion that the main exhaust valves in the heads of the cylinders are maintained well below the point of destructive distillation of the lubricating oil used, due to the fact that the greater portion of the heat passes out through the auxiliary valves, and in order that the latter will serve under such conditions efficaciously, nickel steel heads are used, whereas in the main exhaust valves a type of carbon steel is employed similar to that used in the inlet valves.

There are incidental gains that must be ascribed to the plan involving auxiliary exhaust valves; the heat is distributed uniformly over the cylinders; distortions due to differences in temperature are obviated, and the combustion chamber is maintained at a constant desired temperature, which has a marked effect upon the power delivered by the motor, due to the fact that the weight of mixture taken in per suction stroke.

Referring to Fig. 19 of the intake side of the motor, the carbureter manifold M1 connects, between the carbureter and the distributing manifold, with its branches M2 to the right and M3 to the left, connecting around both ways to M4, with connections leading therefrom to the respective cylinders. The magneto M5 is located inside of the steering gear G1, somewhat below the level of the chassis frame F1, and the wires W1 leading from the magneto are distributed to the respective spark plugs through the tube T1. The same care is taken to control the direction of travel of the cooling air in the intake side of the motor as is observed in the management of the same on the exhaust side as shown in Fig. 13. The valves are actuated by a system of rocker arms, they being in the heads of the cylinders, and the valve springs are placed in relatively cool situation so that they retain their tension permanently. The rocker arms



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and the method of lifting are clearly brought out in Fig. 13, and the springs show in the greatest prominence in Fig. 19.

Referring to Fig. 14, it is shown how the gills G1 are stopped off above the flanges of the auxiliary exhaust ports P1 and P2, but the gills extend down well below the auxiliary exhaust ports excepting where they are stopped off as a matter of necessity. The cylinders are cast individual, and are faced off so that they rest on the finished table T1 of the crankcase, and are held in place by studs S1, of which there are four for each cylinder. The crankcase is made in one piece, and one side is faced off F1 to accommodate the cover for the holes H1, H2, H3 and H4, through which access is gained to the main bearings M1 of the crankshaft, and the connecting rod bearings C1 as well. The crankshaft C2 is inserted through the end plates E1, which are held on by studs S2 so closely spaced that the seam is made oil-tight. These end plates carry the main bearings M2 and M3, they being sufficiently long to take the extra load imposed. There is one additional feature to be noted in connection with the end plates. They are cast integral with the motor arms M4 so that the strain due to the weight of the motor and the contortions of the chassis frame is carried by these arms, rather than by the aluminum crankcase.

The flywheel effect is varied between the four and the six-cylinder motors, being more in the four-cylinder types in order to afford the requisite equalizing moment, and a reduced value

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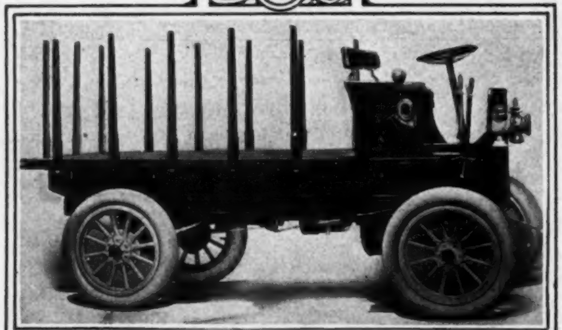

SPECIFICATIONS FOR FRANKLIN

MODELS	Price	H.P.A.L.A.M.	BODY		MOTOR				COOLING		IGNITION	
			Type	Seats	Cyl.	Bore	Stroke	Cyl. Cast.	Radiator	Pump	Magneto	Battery
Model G........	$1950	18.2	T. phaet	2	4	3⅜	4	Single.	Air Cool.	Suc. Fan.	Bosch...	None....
Model G........	1950	18.2	Tour'g..	4	4	3⅜	4	Single.	Air Cool.	Suc. Fan.	Bosch...	None....
Model L-5.......	2400	18.2	Stake Pl	..	4	3⅜	4	Single.	Air Cool.	Suc. Fan.	Bosch...	None....
Model L-5.......	2500	18.2	Express	..	4	3⅜	4	Single.	Air Cool.	Suc. Fan.	Bosch...	None....
Model L-5.......	3700	18.2	Om'bus	10-12	4	3⅜	4	Single.	Air Cool.	Suc. Fan.	Bosch...	None....
Model L-5.......	3500	18.2	Patrol..	10-12	4	3⅜	4	Single.	Air Cool.	Suc. Fan.	Bosch...	None....
Model M........	2700	25.6	Tour'g..	5	4	4	4	Single.	Air Cool.	Suc. Fan.	Bosch...	None....
Model M........	3500	25.6	Limous.	7	4	4	4	Single.	Air Cool.	*Suc. Fan.	Bosch...	None....
Model M........	3500	25.6	Land't..	7	4	4	4	Single.	Air Cool.	Suc. Fan.	Bosch...	One....
Model H........	4500	48.6	Tour'g..	7	6	4½	4½	Single.	Air Cool.	Suc. Fan.	Bosch...	None....
Model H........	4500	48.6	Torp'o..	4	6	4½	4½	Single.	Air Cool.	Suc. Fan.	Bosch...	None....
Model D........	4400	38.4	Land't..	7	6	4	4	Single.	Air Cool.	Suc. Fan.	Bosch...	None....
Model D	3500	38.4	Tour'g..	5	6	4	4	Single.	Air Cool.	Suc. Fan.	Bosch...	None....
Model D........	3500	38.4	Torp'o..	4	6	4	4	Single.	Air Cool.	Suc. Fan.	Bosch...	None....
Model D........	4400	38.4	Limous.	7	6	4	4	Single.	Air Cool.	Suc. Fan.	Bosch...	None....

*Also 96½.

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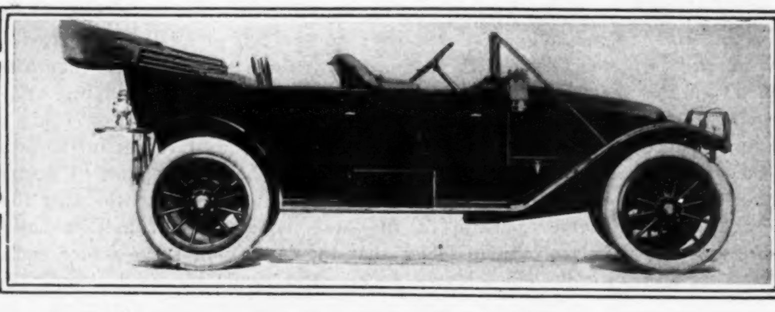

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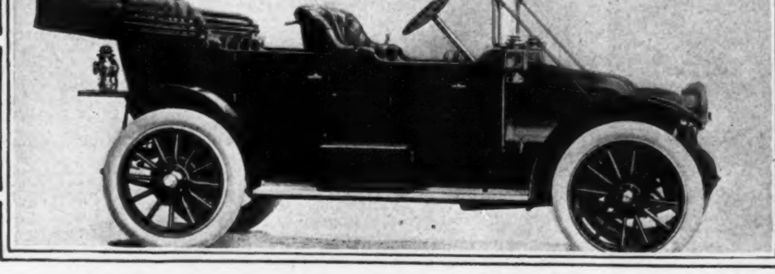

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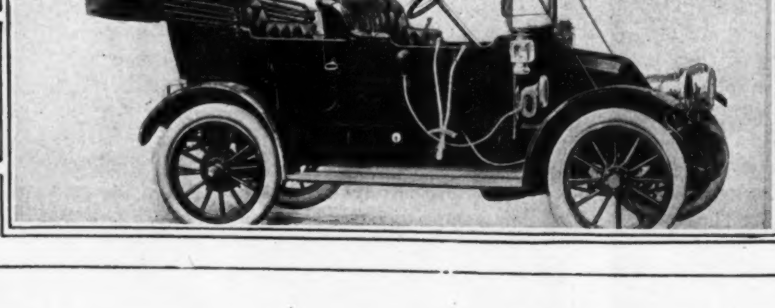


Fig. 1—Model H Open Body Touring Car Seating Seven Passengers, Using the Six-Cylinder 48-Horsepower Motor

Fig. 2—Model M Open Body Touring Car Seating Five Passengers, Using the Four-Cylinder 25-Horsepower Motor

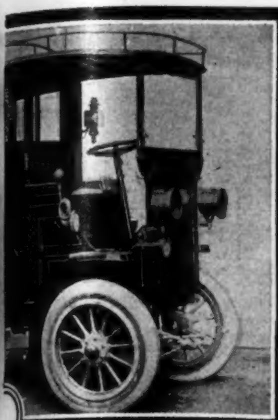
Fig. 3—Model G Open Body Touring Car Seating Four Passengers, Using the 18-Horsepower Four-Cylinder Motor

Fig. 4—Model L-5 Stake Platform Truck with a Capacity of 2,000 Pounds, Using the Four-Cylinder 18-Horsepower Motor

Fig. 5—Model L-5 Passenger Bus Seating 10-12

in the six-cylinder motors in view of the overlapping of the torque, and back of the squirrel-cage air propeller P1, Fig. 17, the multiple-disc clutch is assembled in its housing H1 with a suitable number of discs D, including a thrust block made up of thrust plates P2 and P3, and a plurality of balls in a retainer plate P4.

The general appearance of the carbureter is shown in Fig. 10; it is of the Franklin design. Referring to Fig. 15, attention is called to the nozzle standard N1, with three inserted nozzles N2, N3 and N4, through which the gasoline passes into the surrounding depression chamber, which is of the modified Venturi-tube type. The butterfly valve V1 controls the mixture en route to the motor, but in order to regulate the ratio of gasoline



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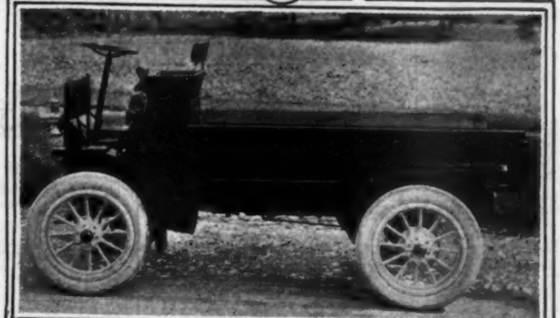

CARS AS OFFERED FOR 1911

	TRANSMISSION							BEARINGS			TIRES	
Clutch	Type	Speeds	Loca-tion	Drive	Wheelbase	Tread	Frame	Crank-shaft	Trans-mis'n	Axle	Front	Rear
M'l disc..	Selecti'e.	3	Unit...	Shaft...	100	56	Wood...	Plain....	Ball....	Ball....	32x3½	32x4
M'l disc..	Selecti'e.	3	Motor..	Shaft...	100	56	Wood...	Plain....	Ball....	Ball....	32x3½	32x4
M'l disc..	Progress.	3	Unit...	Shaft...	94	56	Wood...	Plain....	Ball....	Roller.	36x5½	36x5½
M'l disc..	Progress.	3	Unit...	Shaft...	94	56	Wood...	Plain....	Ball....	Roller...	36x5½	36x5½
M'l disc..	Progress.	3	Unit...	Shaft...	94*	56	Wood...	Plain....	Ball....	Roller...	36x5½	36x5½
M'l disc..	Progress.	3	Unit...	Shaft...	96½	56	Wood...	Plain....	Ball....	Roller...	37x5	37x5
M'l disc..	Selecti'e.	3	Motor..	Shaft...	108	56	Wood...	Plain....	Ball....	Roller...	34x4	34x4½
M'l disc..	Selecti'e.	3	Motor..	Shaft...	108	56	Wood...	Plain....	Ball....	Roller...	34x4	34x4½
M'l disc..	Selecti'e.	3	Motor..	Shaft...	108	56	Wood...	Plain....	Ball....	Roller...	34x4	34x4½
M'l disc..	Selecti'e.	3	Motor..	Shaft...	133	56	Wood...	Plain....	Ball....	Roller...	37x5	38x5½
M'l disc..	Selecti'e.	3	Motor..	Shaft...	126	56	Wood...	Plain....	Ball....	Roller...	37x5	38x5½
M'l disc..	Selecti'e.	3	Motor..	Shaft...	123	56	Wood...	Plain....	Ball....	Roller...	36x4½	37x5
M'l disc..	Selecti'e.	3	Motor..	Shaft...	123	56	Wood...	Plain....	Ball....	Roller...	36x4½	37x5
M'l disc..	Selecti'e.	3	Motor..	Shaft...	123	56	Wood...	Plain...	Ball....	Roller...	36x4½	37x5
M'l disc..	Selecti'e.	3	Motor..	Shaft...	123	56	Wood...	Plain....	Ball....	Roller...	36x4½	37x5

†Chassis Weight.

Fig. 6—Model L-5 Express Body Truck with a Capacity of 2,000 Pounds, Using the Four-Cylinder 18-Horsepower Motor

Fig. 7—Model D Torpedo Phaeton Seating Four Passengers, Using the Six-Cylinder 38-Horsepower Motor

Fig. 8—Model D Open Body Touring Car Seating Five Passengers, Using the Six-Cylinder 38-Horsepower Motor

Fig. 9—Model G Torpedo Phaeton Seating Two Passengers, Using the Four-Cylinder 18-Horsepower Motor

Passengers, Using Four-Cylinder 18-H. P. Motor.

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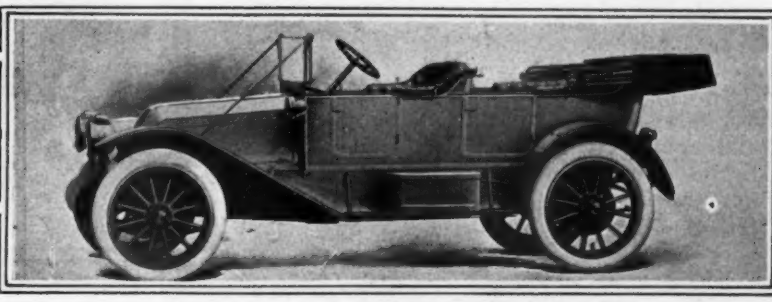

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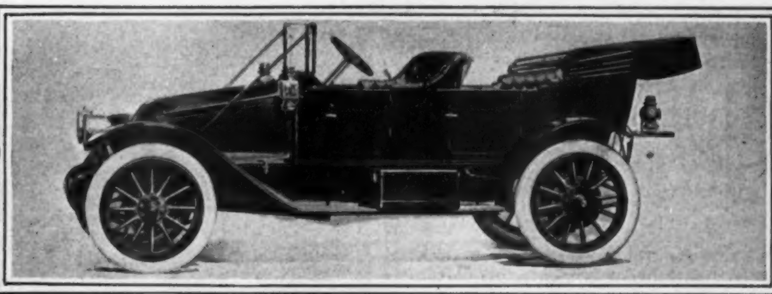

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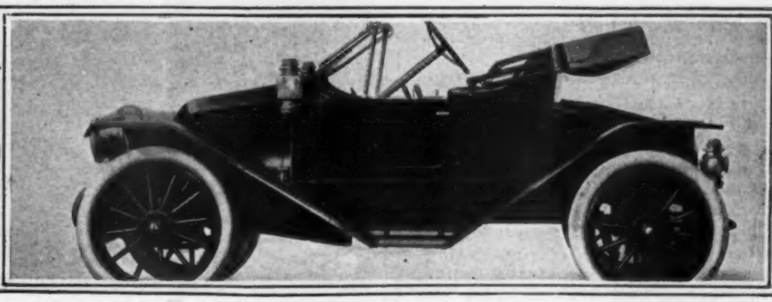
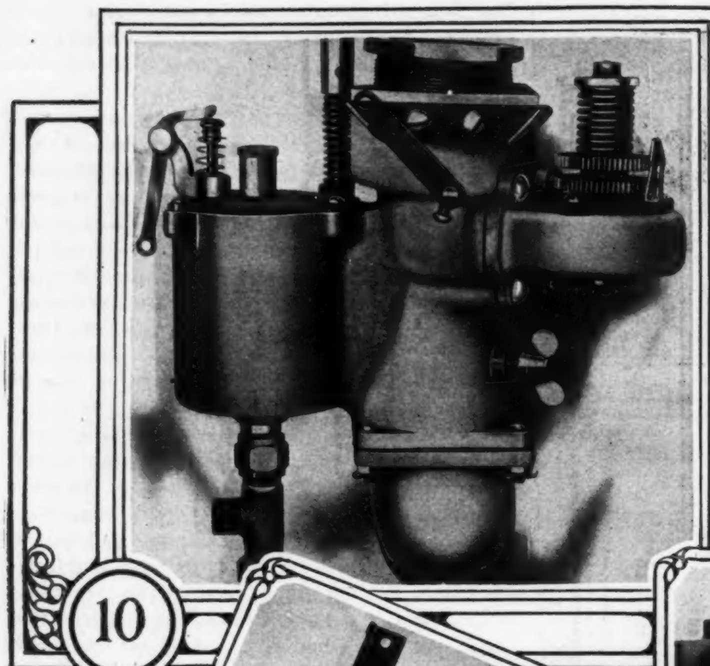


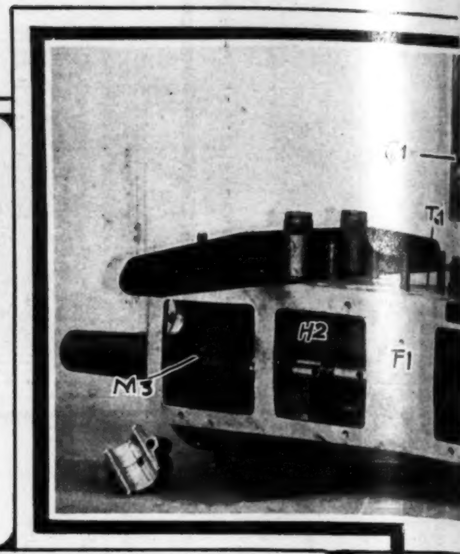
to air an auxiliary air valve is utilized, as shown in Fig. 16 at A1. This valve is of the automatic type, admitting air in response to the suction of the motor, with a means available for regulating the action of the valve, utilizing springs S1 and S2, the tension of which is fixed by manipulating the knurled thumb nuts N1 and N2. The flow of gasoline from the supply pipe P1 is into a filtering chamber C1, thence through the filter into the float bowl B1, under the control of the float F1, lifting the needle off its seat S3 when the gasoline falls below the level of the nozzle orifice by a predetermined amount. As a further means of regulating the flow of gasoline, the needle valve V1 may be regulated by means of the tumble shaft T1 with a universal joint U1. When it is desired to regulate the flow of gasoline this needle valve V1 is screwed down against its seat by turning the shaft P1, the latter extending up to the dash, with a handle to operate it.

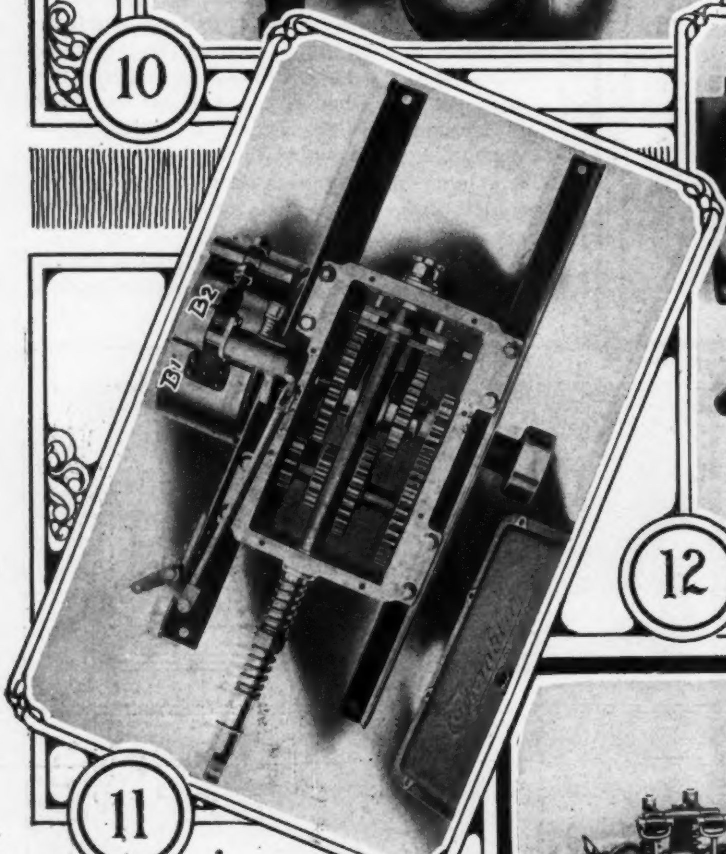
The magneto, which is of the Bosch type, is shown in Fig. 12, disclosing a method of construction that obtains in the Franklin plant, utilizing the unit idea of assembling. The magneto M1, with its extension shaft S1, is driven by the pinion P1, under the control of a governor G1, assembled in the spider S2. On the 18-horsepower engine the spark is fixed, but the remaining models are equipped with a governor, the function of which is to automatically advance the spark, consistent with the requirement, in view of the speed, at any given instant.

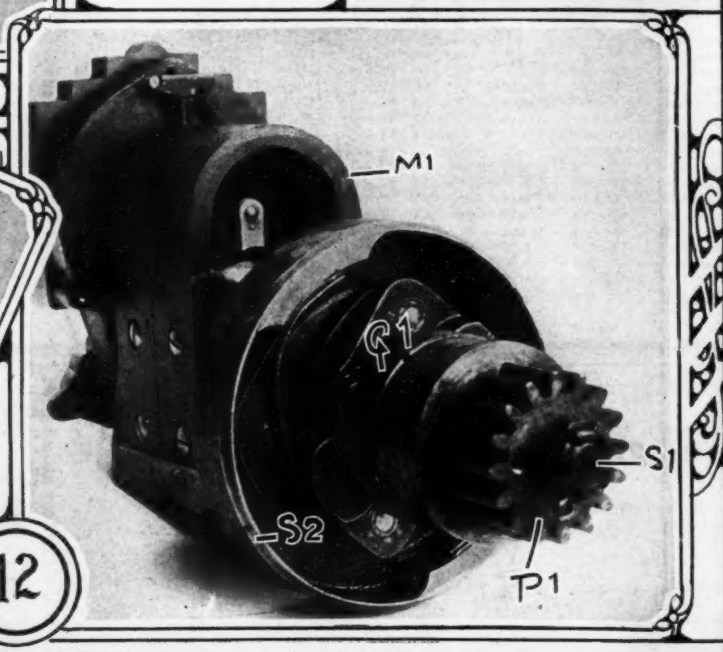
The transmission gear as shown in Fig. 11 is of a light but stout construction, using special nickel steel cut from hammered bars for the gears and spindles, and subject to a specific heat-treatment to afford the requisite wearing qualities. A wide-faced brakedrum with external contracting bands B1 and B2 is included in the transmission unit, and Fig. 18 shows the details of the clutch and the method of taking up for wear with great clearness. One member of the universal joint U1 is nested within the brakedrum B, and the exterior of the crankcase C1 as shown affords an idea of the compactness of the transmission unit.

The tabulation as here offered affords specific information in relation to the respective models.









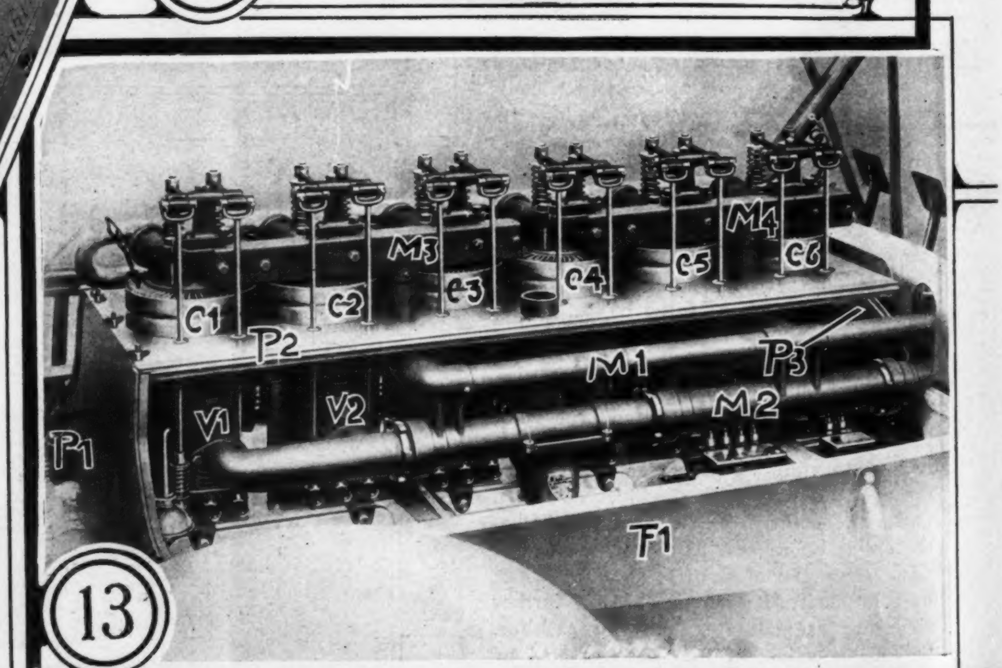


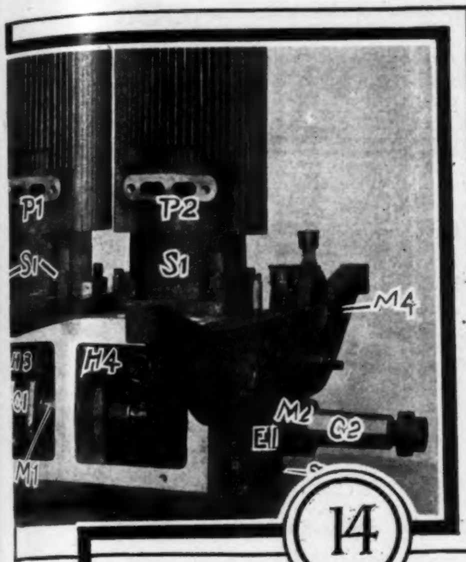
Fig. 10—The Franklin Type of Carbureter, Showing the General Appearance, with Adjustments for the Automatic Valve and Control Mechanisms

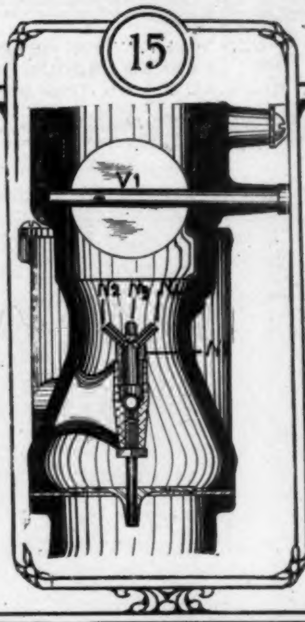
Fig. 11—Looking into the Three-Speed Selective Transmission Gear, Showing the Service Brake Attached

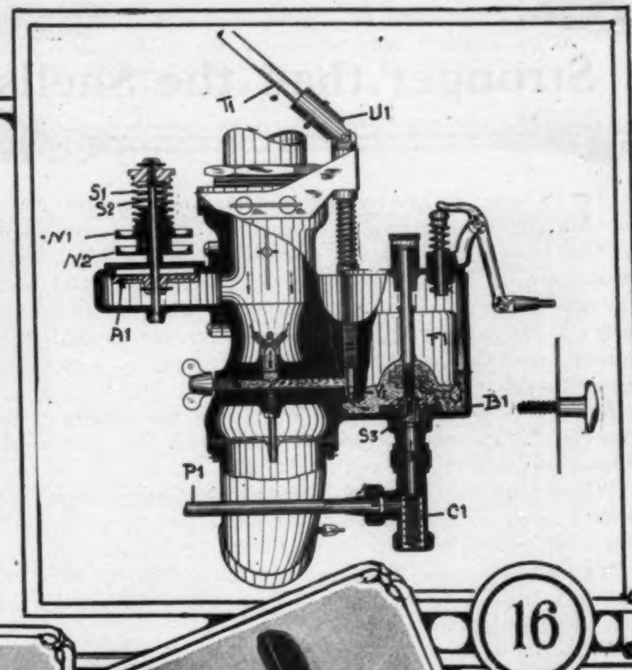
Fig. 12—Magneto Assembly, Presenting the Details of the Governor for Automatically Advancing the Spark

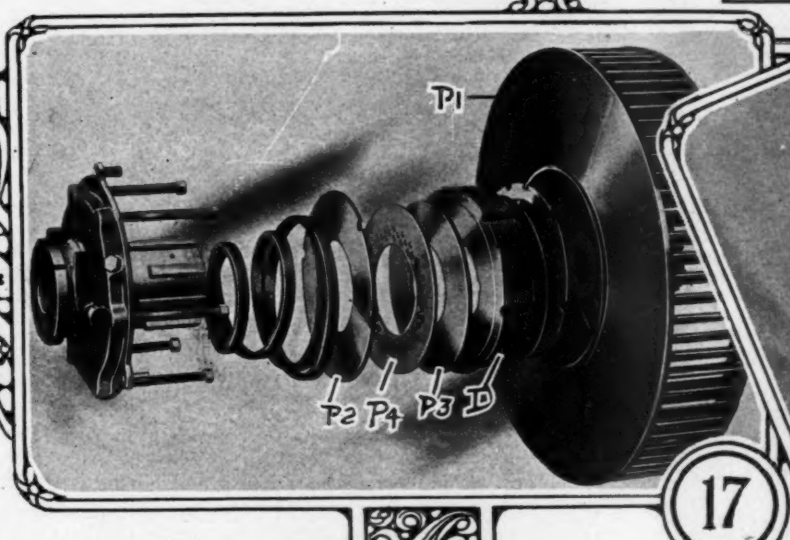
Fig. 13—Exhaust Side of the Six-Cylinder Air-Cooled Motor, Showing the Manifolds from the Initial and Supplementary Exhaust Valves

Fig. 14—Partly Assembled Four-Cylinder Motor with the Covers off, Disclosing the Crankshaft and Two of the Cylinders in Place









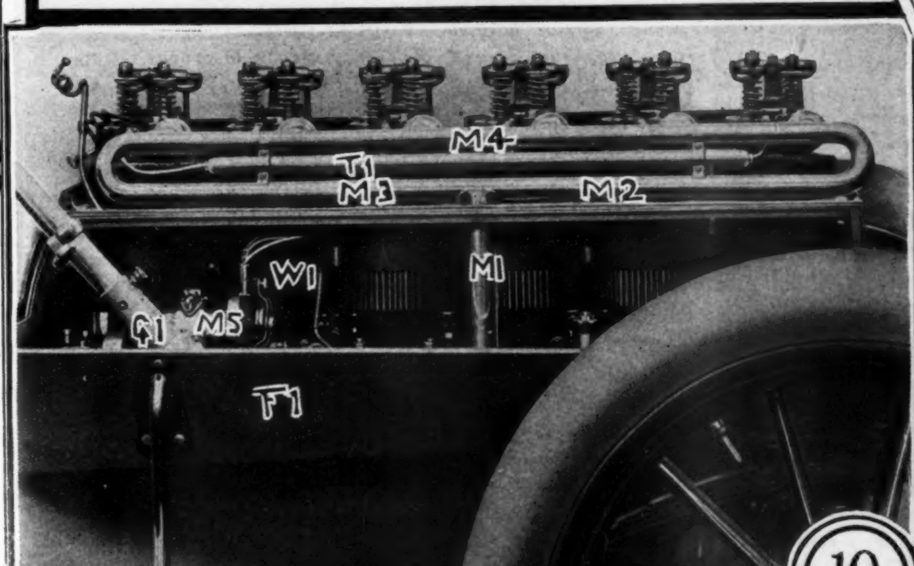


Fig. 15—Section of the Franklin Carbureter through the Multiple Jet Nozzle in the Plane of the Butterfly Valve

Fig. 16—Section of the Carbureter through the Float Bowl, and the Automatic Supplementary Valve

Fig. 17—Squirrel Cage Air Propeller Built Up in the Flywheel, and Multiple Disc Clutch Disassembled to Show the Component Parts

Fig. 18—Transmission Gear and Service Brake System in Perspective, Disclosing Details of the Braking Mechanism

Fig. 19—Intake Side of the Six-Cylinder Air-Cooled Motor, Showing the Location of the Magneto, Position of the Steering Gear, and the Intake Manifold

Stronger than the Shells

"OLD WALT," THE DEEP-SEA HACKMAN, TELLS WHAT HE LEARNED ABOUT THE SURE-THING MEN WHO RACE AUTOS ON THE BUSH CIRCUIT

"'TIS better to hev run and win than never to hev run at all," hummed Walter Thornton O'Brien, better known as "Old Walt," chauffeur and mechanician of one of the most popular deep-sea-going hacks along the White Way. "Old Walt" was indulging in a bit of double-handed work in front of Flaherty's free-lunch counter and paused between mouthfuls to moralize upon the general situation, particularly as it applies to the automobile.

Having finished all the lunch he thought the barkeep would allow him to consume, he stepped back from the counter and nodded toward Flaherty's end of the bar.

"What's that you're singing?" inquired Flaherty, wiping his hands on the bar towel and settling himself to hear the words of wisdom that he was sure would follow the opening.

"It's just a little song that's making a hit up the line," answered Walt. "I heard a fellow singing it to-night and I ast him the same question you ast me."

"What did he say?" asked the proprietor.

"Why, the fellow was one of those automobile guys and I nailed him at the station. He had a grip full of kale and had just landed from a train. He was happy about something and the first thing he sez to me is: 'Hey, kebbie,' sez he, 'drive me around the park a few times; I wants to stack up this junk.'

" 'Must be pretty good in the Bush League,' I sez, and climbs on the box.

"I had taken him two miles when he tells me to pull up in front of Grogan's side door and asts me to have something. We get out and after a round or two he sez:

"'It's a measly shame to take the money. I'm J. Wilfred Wishington, the automobile race promotor,' he sez, and swells up his chest.

"I simply looks at him and feels nervous about the fare. You know, Flaherty, what a bum finish I made last year trying to collect from one of them promoters over on Long Island. I had to black his eyes and break his nose and two ribs before I found that he had been joy-riding without the necessary funds. I was almost tempted to use force in that case, but durn my tender heart, I just couldn't bring myself to it.

"'We certainly slipped one over,' chuckled my fare. 'Y'see the bush racing game is a frame-up most generally. All y'have to do is to get a sanction from the Three B's and invite the natives to participate. Then when some of the smart Alecs enter, all y'have to do is to slip one of your ringers into the event and there ain't a living chanct for the Alecs to collect any prize money. The durn fool public ain't wise yet, although the game is a little tougher than it was last year. They came pretty near handing us one a while ago, though. Y'see some jealous gink wants to annoy us and he slips in a big, strong car in the biggest race we've carded. He has it jiggered up like a dope-horse and disguised so that we didn't suspect nothing until post time. Our car was about twict as big as anything in the race except the ringer, but after the start we found without no sense of glad surprise that somebody had been trifling with our "extra agent of oxidation." In fact, we found that the agent had been slipped into the tanks of the ringer instead of into those of our car.

"'Well, they was off in a cloud of dust and the ringer shot out in front and led us for eight miles and going easy. It was a ten-mile race and we had to do something quick. So I take an axe-handle and runs up the stretch about to the last eighth pole and waits for the ringer.

"'I waved to the ringer to stop and he like a chump done so. I told him he was suspected of using some unfair means of giving his mixture a kick and held him until our mut came along and got such a lead on the last mile that the ringer didn't have a chanct.

" 'The ringer was a sore butcher, but we needed the money and it would never do to let anybody get away with anything; which, by the way, they did not."

"Well, but what's the answer?" inquired Flaherty as Walt stiffened up and accosted a newcomer, evidently in a hurry, with: "Keb, sir?"

Saturated Mixtures of Air and Vapor

Primarily the weight of any vapor that air will hold will depend upon the temperature to which it is raised, and the higher the temperature the greater will be the volume, and the lower the weight of the air. A state of saturation will follow for each temperature, and while the volume of air will increase with increasing temperature, thus decreasing weight, even so, the capacity of the air for vapor will increase. The weight of vapor per hundred pounds of air, at different temperatures, may be determined in the manner as follows:

$$w = \frac{62.3 \times E}{29.92 - E} \times \frac{29.92}{p}$$

When,

E = elastic force of the vapor at the given temperature, in inches of mercury;

p = absolute pressure in inches of mercury, = 29.92 for the pressure of the atmosphere as ordinarily taken;

w = weight, in pounds, of vapor, for complete saturation, at the given temperature, at which the elastic force is determined.

The vapor carrying ability of the air is of the utmost importance in connection with carburetion, since, if the air is not in a state to hold vapor of gasoline to the desired extent, the results will fall off accordingly. The accompanying table will serve to render comparison potent, as well as to clearly indicate the reasons why atmospheric influences do affect the performance of cars in practice.

CAPACITY OF ATMOSPHERIC AIR FOR VAPOR AT DIFFERENT TEMPERATURES

Temperature in degrees Fahrenheit	Pounds per cu. ft. dry air	Pounds of vapor in one pound of air	Weight in pounds cu. ft. Saturated Air	Vapor in air	A|V
32	0.0807	0.00379	0.0802	0.000304	263.7
42	0.0791	0.00561	0.0784	0.000440	178.18
52	0.0776	0.00819	0.0766	0.000627	122.
62	0.0761	0.01179	0.0747	0.000881	85.
72	0.0747	0.01680	0.0727	0.001221	59.5
82	0.0733	0.02361	0.0706	0.001667	42.3
92	0.0720	0.03289	0.0684	0.002250	30.3
102	0.0707	0.04547	0.0659	0.002997	22.

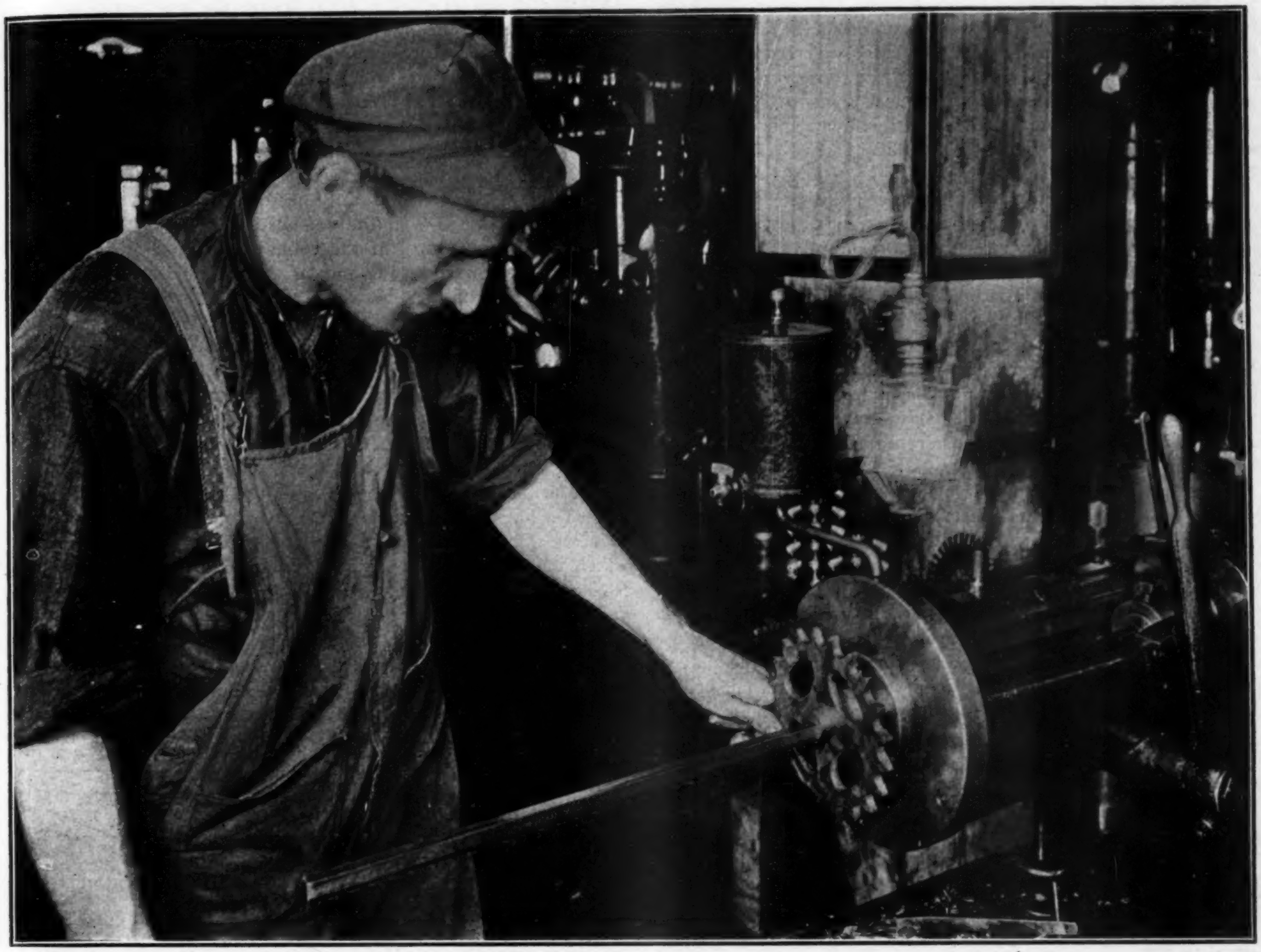
The ratio A to V clearly indicates the rate at which the air changes in its ability to sustain a vapor, and, too, the effect produced on the weight of vapor per cubic foot of the air.

A Timely Tip to the Tyro

When buying a car, insist upon magneto being fitted; there is nothing more annoying than to have to stop on account of a battery being run down. When the magneto is fitted there is often a secondary ignition one can fall back upon, and a good way to see that this is always in proper order is to light the side lamps by electricity and kerosene as well. The driver will have to see that the batteries are charged for his lights and at the same time you will be able to use the current for starting and in case of trouble with the magneto.

Engineering Section

DEVOTED TO THE DISCUSSION OF ENGINEERING PHASES OF AUTOMOBILING, INCLUDING DESIGNING AND CONSTRUCTION FEATURES OF PRODUCTS, AND INFORMATION TO AUTOISTS



ILLUSTRATING METHOD EMPLOYED IN BROACHING SQUARE HOLES IN SPROCKET WHEELS AND GEARS AT WOODS PLANT

WE are given to understand that God made man in the exact image of Himself and that nothing is hard or impossible to Him. Reasoning backwards, a process that every man should practice, there is nothing hard or impossible to man. In other words, if man is a replica of his Maker, and there is nothing hard or impossible to the Creator, then it is self-evident that there is nothing hard or impossible to man. This form of reasoning is taken for the time being to help inventors to appreciate the fact that they are not justified in neglecting to devise some form of mechanical wheel that will be quite satisfactory in automobile work; doing all that rubber is supposed to do, costing less to make and much less to maintain. It is far from a credit to the brains with which America is so liberally endowed that almost no progress is being made in this broad field, and, as the rubber men claim, the demand for that material, also of the better grades of cotton, is outstripping the supply, so that the needs of to-day are infinitesimal as compared with what they will be to-morrow, to say nothing about the influence of years upon this most important phase of industrial development.

When rubber strayed into the arts it brought with it a good example of the character of service that is wanted, but this material seems to labor under great difficulty in commercially imitating its own good example. If there is no possible chance of improvement on the length of service that rubber is capable of giving, then what is wanted is the service that rubber seems to render so efficaciously, the same to be delivered by some other material that will last longer under actual working conditions. The form of the new wheel may have to be quite different from all present forms; there may have to be many modifications of present practice, but all such matters are the merest details in the face of the main demand. Don't be discouraged; go to work.

Cantor Lectures on Motors

PROFESSOR W. WATSON, D.SC., F.R.S., DELIVERED THREE LECTURES ON THE GASOLINE MOTOR, OF WHICH THIS IS THE OPENING—BY PERMISSION OF THE ROYAL SOCIETY OF ARTS

IN these lectures I propose rather to deal with generalities and principles which are common to all petrol engines than to describe those details of construction which vary from one make of engine to another. I shall commence, however, by briefly describing in this first lecture some typical forms of engine, since a knowledge of the general construction will be required in order to follow some of the points with which I shall be dealing in the subsequent lectures.

Petrol engines, like all other internal-combustion engines, may be divided into two great classes, according as an explosion takes place in each cylinder once in every two revolutions of the crankshaft, or once in every revolution of the crankshaft. Engines belonging to the first of these classes are called four-cycle, or Otto-cycle engines, because the whole cycle of operations in each cylinder repeats itself after four strokes of the piston, two of these strokes taking place in one direction and two in the opposite direction, this corresponding to two complete revolutions of the crankshaft. Engines of the other class are called two-cycle engines, and here the complete cycle is repeated after two strokes of the piston.

Let us first consider the four-cycle engine. The sectional model which I exhibit represents what, up to within two years ago, appeared to be the type to which all engines of this class were settling down, and even now the vast majority of engines only differ from that shown in minor details. The peculiarity which distinguishes this type lies in the manner in which the admission of the explosive charge to the cylinder and the escape of the burnt products is governed, that is in the form of the valves. These valves, which are called poppet valves, are mushroom shaped, and they fit down on a conical seating formed by the cylinder wall. The valves are raised off their seats when required by means of cams on a shaft or shafts, which are connected, by gearing, to the crankshaft, and turn at half the speed of the crankshaft. In some engines the valves are in separate pockets, on opposite sides of the cylinder head, as shown in the model. In others the two valves are in the same pocket, while, finally, in some engines there are no valve pockets, but the valves are in the cylinder head.

Turning the crank of the model it will be observed that as the piston descends the inlet valve opens and allows a charge of petrol and air to be drawn into the cylinder. When the crank has slightly passed the lower dead center, the inlet valve closes, and then the rising piston compresses the charge. Just before the piston reaches the top of its stroke an electric spark is passed which ignites the charge. As we shall see, however, the mixture of air and petrol gets alight very slowly, so that before the pressure has appreciably increased, due to ignition, the piston will have reached the top of the stroke. While the piston is descending, the pressure developed by the burning of the charge does work, the downward pressure of the gases on the piston being converted into a turning movement on the crankshaft by the connecting rod and crank. A little before the piston reaches the bottom of its stroke, the exhaust valve is opened, and allows the hot gases to escape from the cylinder, the pressure in the cylinder rapidly falling from about 40 pounds per square inch to nearly atmospheric pressure. During the upstroke of the piston, the exhaust products remaining in the cylinder, are further expelled through the exhaust valve, which remains open throughout this stroke. The whole of the products of the explosion are not expelled, for the piston, when at the top of its stroke, leaves a space in the combustion head of the cylinder, which is about a fourth of the volume swept out by the piston. The cycle is now complete, and, as the piston descends, a fresh charge is drawn in and the whole process is repeated.

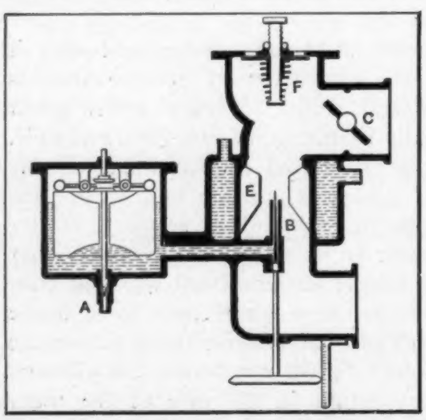


Fig. 1—Showing a simple form of jet carbureter

It seemed at one time as if the poppet valve would continue to be used exclusively, but the adoption, last year, of the Knight pattern of sleeve valve by the English Daimler Company, to the exclusion of the poppet valve, and the triumphant way in which two such engines came through a full-load test, lasting for 132 hours continuous run, conducted by the Royal Automobile Club, has not only silenced those who ridiculed the idea that there would be anything to compete with the poppet valve, but has started a number of designers and inventors testing other forms of valve. The section model exhibited, and the sectioned engine, which the Daimler Company have been good enough to lend me to show you this evening, will enable you to see how the Knight valve works. There are two sleeves inside the cylinder, the piston itself moving inside the inner sleeve. Ports are cut in the upper portions of the sleeves, those on one side for the inlet and those on the other for the exhaust. The sleeves are given a reciprocating motion by means of two eccentrics which are carried on a long shaft, which turns at half the speed of the crankshaft. As I rotate the crank (the piston starting at the top of its stroke), you will notice that the ports in the right of the sleeves register with the inlet port, thus allowing the charge to enter. By the time the piston has reached the bottom of the stroke, the ports in the sleeves no longer register, and, as the piston rises, communication is entirely cut off, so that the charge is compressed. When the piston has nearly reached the end of its path on the firing stroke, the ports on the left-hand sides of the sleeves register with the exhaust port, allowing the gases to escape, and this continues during the whole of the exhaust stroke. The peculiarity of this engine, to which I desire to call particular attention, is the large size of the inlet and exhaust ports. This can be clearly seen in the two separate sleeves which are exhibited. The size of the ports, and the uninterrupted path provided for the gases is a matter of very considerable importance.

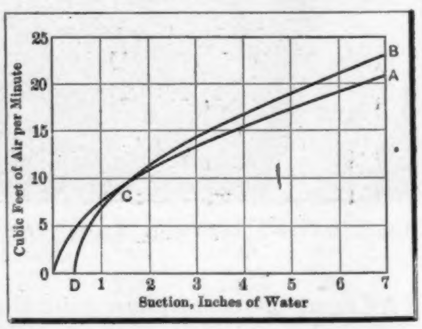


Fig. 2—Curve showing air taken in at different pressures

In the four-cylinder engines described above the cylinders and the crankcase to which they are attached are held fixed, while the crankshaft revolves, and with such a design it is necessary to provide a flywheel, even when four or six cylinders are used. In order to save the weight of the flywheel some designers of engines for aviation purposes have inverted the above-mentioned arrangement, the crankshaft being held stationary, while the

cylinders and crankcase revolve, the propeller being either directly attached to the crankcase or driven by a sprocket carried by the crankcase. With this arrangement the cylinders themselves act as flywheel, so that the weight of a separate flywheel is avoided. Further, the movement of the cylinders through the air keeps them cool, so that no separate cooling arrangement, such as a waterjacket or fan, is required.

A diagrammatic section of the Gnome seven-cylinder rotary engine is shown, from which you will be able to form some idea of the general arrangements. Since, however, I have been unable to obtain drawings of the engine, the details shown must only be considered as more or less conjectural. It will be noticed that only one connecting rod has a bearing on the crankpin. The other connecting rods have bearings on this one connecting rod. The inlet valves are fitted to the top of the pistons, so that the charge enters the cylinders from the crankcase. The charge enters the crankcase through an axial hole down the stationary crankshaft. The exhaust valves are in the head of the combustion space, and are operated by levers and a camshaft, which turns at half the engine speed. It will be noticed that balance weights are provided to the valves. The object of these balance weights is to eliminate the effect of centrifugal force. The necessity for such balance weights will be obvious when I state that if the inlet valves weigh only 4 ounces, the centrifugal force at 1,200 revolutions per minute would amount to 160 pounds.

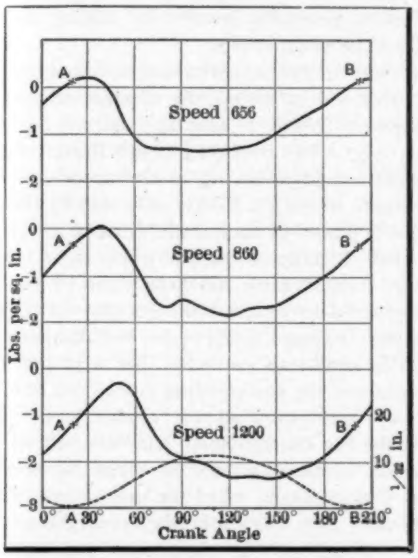


Fig. 3—Curve of pressure measured in the intake pipe of a four-cylinder engine

The great difficulty with the rotary type of engine seems to be that of securing adequate lubrication without an excessive consumption of oil. Thus, in a test of one Gnome engine, conducted by the French Automobile Club, the consumption of oil per horsepower-hour was 0.4 pounds, just half the consumption of petrol. An engine of the ordinary stationary cylinder type hardly ever requires more than about 0.05 pounds of lubricant per horsepower-hour, even when run continuously at full load.

The other diagram represents the two-cylinder, five-horsepower Granville rotary engine, which is of English design and manufacture. Here, as in the Gnome, the inlet valves are of the automatic type, *i. e.*, are opened by the fall of pressure in the cylinder on the induction stroke, and are situated in the piston head.

It is of interest to note that if the impulses due to the working strokes of the various cylinders are to be equally distributed throughout each rotation of the engine, it is necessary that there shall be an odd number of cylinders. This is at once evident if we remember that one complete cycle of each cylinder occupies two complete revolutions of the engine. Hence the firing of every alternate cylinder must follow, and, going round in this way, taking every cylinder, we must include all the cylinders while going twice round.

The two-cycle engines, in which there is a working stroke in each cylinder for each revolution of the crankshaft, act on a cycle which is the invention of Mr. Dugald Clerk. Although there are comparatively a small number of two-cycle petrol engines in use in England, in America there are a large number—chiefly in boats.

The principle on which most of these engines work is illustrated by means of the section model I now show. Let us suppose the piston to be at the top of the stroke, the combustion space containing a charge of inflammable mixture which has just been fired. The piston then descends on the working stroke and when near the end of the stroke it uncovers an exhaust port on the right-hand side of the model, allowing the exhaust gases to escape. During the descent of the piston the gases in the crankcase have been slightly compressed, and when, by its further descent, the piston uncovers a port connected with a short passage leading to the crankcase, these compressed gases flow through into the cylinder. The current of incoming gas is deflected upward by a baffle plate attached to the upper surface of the piston, and as they fill the cylinder they drive out most of the exhaust products through the exhaust port which is still open. As the piston rises it first covers the port leading to the crankcase and then the exhaust port. Further rise compresses the charge, which is ignited when the piston is nearly at the top of the stroke. During the rise of the piston a partial vacuum has been produced in the crankcase, and, when the piston is nearly at the top of its stroke, its lower edge uncovers a port connected to a carbureter, through which an explosive mixture rushes in to fill the crankcase. It is this explosive mixture which, after being compressed by the descending piston, passes into the cylinder through the inlet port when the piston reaches the lowest part of the stroke. It will be noticed that there are no valves in this engine, the piston itself performing the functions of both inlet and exhaust valve. The further consideration of this engine I will postpone till the next lecture, when I will exhibit some indicator diagrams, and discuss some of the advantages and disadvantages of this type. I may, however, draw attention to one of the chief difficulties in designing a satisfactory two-cycle engine. This is to prevent loss of the incoming charge through the exhaust port, and admixture of exhaust products with the fresh charge. In the case of the Lucas two-cycle engine, an attempt has been made to overcome this difficulty by dividing the cylinder into two parts; in each part there is a piston, the one piston uncovering the exhaust port and the other piston the inlet port. Since the combustion head is common to the two portions of the cylinder, the entering charge can blow right through, sweeping the exhaust products before it, and the liability to admixture between the fresh charge and the exhaust products, and the escape of the fresh charge through the exhaust port, is greatly diminished. Owing to the kindness of the Valveless Car Company I am able to exhibit a section model of the Lucas engine, from which the working of the engine will be clear.

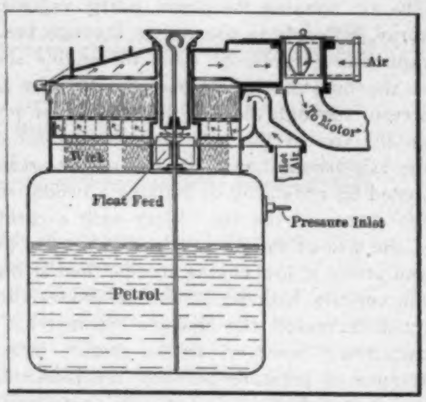


Fig. 4—Type of carbureter used on the Lanchester motor

Having briefly described the general construction of a petrol engine, it is necessary to consider, equally briefly, some of the auxiliary apparatus necessary before the engine can function. Chief among these is some arrangement for supplying an explosive mixture of air and petrol power, *i. e.*, a carbureter. Here, as before, I shall only take examples of the two types in common use in their most simple form. In the first class, which in practice is the most numerous, the petrol is supplied through a fine orifice or jet, and the air, as it passes to the cylinder, is sucked past this jet, and mingles with the petrol. A simple form of jet carbureter is shown diagrammatically, in section, in Fig. 1. The petrol reaches the carbureter by the pipe A and by means of a float and needle valve the level of the petrol in the jet B is kept normally a little below the top of the jet. The air enters at D, and at E passes a construction which surrounds the jet.

The air carrying the petrol, partly vaporized and partly as a fine spray, proceeds to the engine through the tube C. Owing to the reduction of pressure when the engine sucks air through C, and to the flow of the air past the jet, the petrol is projected in a stream through the jet, the amount of petrol flowing depending on the size of the hole and the amount of suction exerted. In the carbureter shown, the size of the orifice of the jet can be adjusted by advancing or retiring a needle which passes up through the center of the jet. With such a carbureter it is found that if the size of the jet is adjusted to give a correct mixture of air and petrol at low engine speeds, then at high engine speeds, when the velocity with which the air passes through the carbureter is much increased, the mixture becomes too rich in petrol. In this carbureter, however, as the suction increases, so that the difference in pressure between the induction pipe C and the external air increases, a valve F opens and admits air which has not passed the petrol jet, and this extra air mixes with the too rich mixture formed by the air which has entered at D, and so tends to keep the strength of the mixture supplied to the engine at the proper value. The necessity for the extra air at high engine speeds, *i. e.*, when the suction increases, is clearly shown by the curves given in Fig. 2. The curve O C A represents the number of cubic feet of air which will pass through a given carbureter for different values of the suction, that is of the pressure difference between the induction pipe and the external air. The curve D C B represents the amount of air which would have to pass in order that, when mixed with the petrol which was found to flow, it should give a correct mixture. It will be observed that till the suction amounted to nearly half an inch of water no petrol flowed. From this point up to a suction of about 1.7 inches the actual amount of air, as shown by the curve OC, is greater than the amount required to supply a correct mixture as shown by the curve D C, that is to say for engine speeds below that which will produce a suction of 1.7 inches of water, the mixture supplied is too weak. For higher engine speeds, on the other hand, it will be noticed that the mixture supplied is too rich. The meanings to be attached to the terms "too weak" and "too rich" will appear later when we are dealing with the combustion of air-petrol mixtures. The curves given in Fig. 2 were obtained when a constant suction was maintained, but when we come to attempt to apply these results to an engine, matters are further complicated by the fact that the suction exerted, even by a multi-cylinder engine, is by no means constant. This is clearly shown by the curves given in Fig. 3, which represent the pressures measured in the induction pipe of a four-cylinder engine at three speeds. The subject of the action of a jet carbureter is a most complex one, almost as complicated as are some carbureters on the market; and it will not be possible to consider it further in the time at my disposal.

The other type of carbureter is one in which the air, or at any rate part of it, as it passes into the induction pipe is drawn over a large surface of lamp wick, these wicks sucking up petrol from a reservoir. The best known carbureter of this type is that used on the Lanchester cars, and is shown in Fig. 4. Only part of the air passes over the wicks, this air being heated so as to assist the vaporization of the petrol. This air becomes heavily charged with petrol vapor, and is mixed with a certain proportion of cold air, which enters by the port marked "Air" on the figure. The advantage of this form of carbureter is that it is much simpler to regulate the constancy of the proportions of the hot petrol-charged air to the cold air, as we are dealing in each case with a gas, than to regulate the constancy of the proportion of liquid petrol flowing through a narrow orifice, to that of the air, which is a gas, for the laws of flow of gases and liquids are by no means the same.

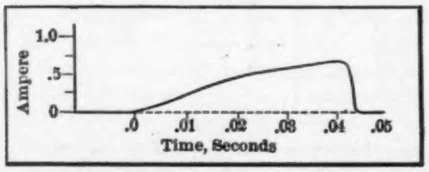


Fig. 5—Oscillograph curve of spark-coil performance

Since a considerable proportion of the petrol is vaporized in the carbureter and induction pipe, owing to the latent heat of the vapor, unless some method of heating is employed the temperature of the carbureter will soon fall below zero. That the vaporization of petrol will cause such a fall in temperature I can show by blowing air through some petrol contained in a flask. The temperature soon falls below zero, which fact is shown by the flask freezing a little water on which it stands, so that a block of wood adheres to the flask. The objection to the excessive cooling of the carbureter is that the vaporization of the petrol is retarded, so that an increased quantity of petrol is sucked into the cylinder in the liquid condition, and the presence of this liquid petrol probably increases the rate at which a crust of carbon forms in the combustion head. Further, if the temperature of the carbureter sinks below zero, the moisture, which is always contained in the air, becomes deposited as snow, and the carbureter becomes choked. The necessary heat can be supplied either by providing the carbureter with a jacket, through which some of the circulating water, or exhaust gas, is passed, or by heating the air before it enters the carbureter. This is generally secured by taking the air from the neighborhood of the exhaust pipe.

I shall proceed to show one or two experiments to illustrate the principles which are involved in firing the charge in the cylinder of a gasoline engine. When I pass an electric current through this coil, not only is the iron core magnetized, but also what is called a magnetic field is set up in the space surrounding the coil. The presence of such a field is indicated by the movement of a compass needle placed at some little distance from the coil. Now to move such a compass needle work must be done, and in the case before us this work has been done by the battery which has been employed to produce the current in the coil. Not only has the battery exerted a force on the compass needle, the effect of which is visible to us, but it has also produced a state of strain throughout the surrounding space, and has thus done work, although by our senses we are unable to perceive it. I can, however, make the energy which has been stored up in the medium in this way evident by suddenly breaking the circuit, so that a current no longer passes, when the energy stored up is returned to the coil, and, as a result, produces very considerable electrical effects. Thus, in this experiment the two ends of the coil are joined together through an electric lamp which to make it glow brightly would require a much higher voltage than exists while the current is passing. When, however, I break the circuit, so as to cut the battery out entirely, the energy in the field, which returns to the coil, is sufficiently great to cause the filament to flash out very brightly. That this effect is due to the energy stored in the field I can at once show, for the windings of the coil are double, and I can cause the current in the two halves either to circulate in the same direction or in opposite directions. In the experiment just shown they circulated in the same direction. I will now reverse the current in one of the windings. We now have the same current flowing as before and just as many turns of wire. There is no magnetic field, however, the iron core is not magnetized and the compass needle is not affected. On breaking the current the lamp does not glow.

The same effect can be shown by simply breaking the circuit in such a way that you can see the spark produced. With the current circulating in the same direction in both sets of windings a bright spark is produced. If, however, the direction of the current in one winding is reversed there is hardly any spark. This coil, and the spark which occurs when the circuit is broken, is an example of what is called the low-tension system of ignition. In this system there is a movable contact inside the engine cylinder, and by means of a cam or some such device, just before the piston reaches the top of the stroke on the compression, a circuit containing a battery and coil is first completed and then suddenly broken by the separation of the movable contact within the cylinder, the spark produced firing the charge.

The kind of time the current takes to reach its maximum value in an ordinary low-tension coil is shown in Fig. 5, which gives the curve obtained by Prof. F. W. Springer by means of an oscillograph. It will be seen that the current was still rising after 0.04 seconds.

(To be continued)

In the Operation of a Car

THE STEERING WHEEL SWITCH; USING THE MOTOR IN STOPPING THE CAR; OTHER MEASURES FOR SAFE DRIVING. BY JAMES S. MADISON

ANYTHING which adds to the comfort or pleasure of the man or woman behind the wheel or anything which increases one's skill or tends to make the control of the car more perfect, is a boon for which we should be cordially grateful. Of all the accessories and additions which an owner may purchase for his car there are not many that are capable of giving him so much satisfaction as to have the control of the ignition under his thumb on the steering post or on one of the cross-pieces of the wheel. While many articles have been written directing attention to the obvious advantages of this simple device, it has been adopted by surprisingly few. Its merits and advantages are so pronounced that it is rather remarkable that its adoption has not become general. A recent count of automobiles passing a certain point on the Jersey Coast showed that out of 100 only 3 had the switch on the steering post or wheel.

With the present style switches of the lever, plug or knife variety, which are usually mounted on the dash, it is always necessary, in order to cut off the ignition at any moment, to lean forward, in what is often an uncomfortable position, and throw the switch with one hand, leaving the other free to steer the car if it is moving, or to remove one foot from the clutch or brake-pedal and throw the switch if it be of the lever or knife variety. If it be of the old-fashioned plug type, the hand must necessarily be used.

It is an excellent practice, as the initiated know, to use the engine for braking purposes on all possible occasions. The tendency to brake with the engine is a growing one. No driver should be satisfied with his progress until he has learned to use his engine as a brake regularly and consistently—this is one of the elements of skillful driving. With the control of the ignition on the steering post or wheel this becomes a simple matter, since the ignition is cut off or turned on with the thumb or a finger with the same ease that the spark or throttle lever is advanced or retarded. The definite advantages in having the mechanism controlling the ignition so conveniently placed that it requires no effort to manipulate it, are these:

1. In coasting down a hill, even a short one of not more than 50 yards, the ignition may be cut off, leaving the clutch engaged. This will cause the explosions to cease, but the fan and pump and all other moving parts actuated by the engine will continue in motion and perform their functions just as they do when the explosions are driving the pistons out and in. This gives the engine an excellent opportunity to cool off. When the ignition is cut off one should not fail to close the throttle, otherwise an explosive mixture will be drawn into the cylinders and transferred to the muffler, which may be easily damaged by the explosion which would follow on turning on the current. This is an economical procedure in so far as it saves gasoline, oil and current (unless one is running on a magneto). The disadvantage is that when the clutch is let in, near the bottom of the hill, there is a certain jar to the chassis and body, and a certain wear of the clutch which is avoided by leaving it engaged and cutting off the ignition.

2. In going along a crowded city street it is sometimes necessary to throw out the clutch and apply the brake many times before the car is clear of the congested traffic, or to reduce the speed by letting the clutch slip. The same object may frequently be accomplished more easily and economically by throwing the ignition off and on as often as may be necessary.

3. In descending a hill with a right-angle turn at the bottom, a condition frequently met in city or town streets, the turn may be easily and safely taken with the ignition off.

There are other advantages of the same kind that will readily suggest themselves to the careful driver.

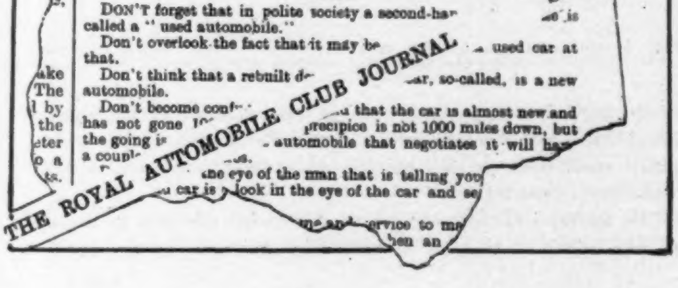
To attach the device to the steering column proceed as follows: Select a suitable switch of any convenient size of the lever type, at any price the buyer wishes to pay from 25 cents up. This should be mounted on a block of wood about 2 1-2 x 3 x 5-16 inches, the back of which is hollowed out so that it will closely fit the steering post. The switch is fastened to the block by three small brass screws. The block is secured to the post by means of a piece of tin, sheet brass, or copper (which has been bent carefully to fit the post) fastened to the block by four small brass screws. The piece of metal is then painted black unless the steering column should be nickel-plated, in which case it would be desirable to use a piece of nickeled brass or aluminum. The binding posts of the switch are then connected to the magneto or battery, as the case may be, by a good quality of waterproofed insulated wire, of inconspicuous color, which is wrapped two or three times around the steering column. If one wishes to avoid the bother of making a switch for the wheel or post, he will find very excellent ones of neat design on the market costing from $3.50 to $5.

The only disadvantage the writer has found from using this device was owing to the fact that the bulb of the horn on his car is also fastened on the steering post, in order that it may be reached more easily than if it were at the side. It is necessary at times to leave the car stand for an hour or more in exposed places. On two occasions the passing small boys in surreptitiously honking the horn, inadvertently or otherwise threw on the switch, with disastrous results to the battery. In order to eliminate this trouble, a common "Ideal" knife-blade switch, costing 25 cents, was screwed on the battery box; one of the lead wires was cut and the two ends connected to the binding posts of the switch. When it is necessary now to leave the car stand unprotected for any length of time, the knife blade switch is left open.

If a car provided with such a switch should be caught without the top in a rainstorm, it would be necessary to protect the exposed parts of the switch from the rain in order to prevent faulty ignition.

Took Permission to Publish for Granted

There are two sides to every question, and, while the giving of credit may convey a flattery, it might even be construed to the contrary. But when the plagiarist exhibits absent-mindedness, it is the sincerest of flattery, for then it is plain, on the face of it, that he wishes to retain the credit for himself.


More "Don'ts for Automobilists."

SEPT. 29, 1910

DON'T forget that in polite society a second-ha[illegible] is called a "used automobile."

Don't overlook the fact that it may be [illegible] used car at that.

Don't think that a rebuilt [illegible] car, so-called, is a new automobile.

Don't become con[illegible] that the car is almost new and has not gone [illegible] precipice is not 1000 miles down, but the going is [illegible] automobile that negotiates it will ha[illegible] a coupl[illegible]

[illegible] the eye of the man that is telling you [illegible] car is [illegible] look in the eye of the car and se[illegible]

[illegible] and service to m[illegible] then an [illegible]

THE ROYAL AUTOMOBILE CLUB JOURNAL

1910 Edison Storage Battery

SECOND INSTALLMENT—DEALING WITH WALTER E. HOLLAND'S PAPER AS PRESENTED BEFORE THE TWENTY-SIXTH ANNUAL MEETING OF THE ASSOCIATION OF EDISON ILLUMINATING COMPANIES, HELD AT FRONTENAC, THOUSAND ISLANDS, N. Y., SEPTEMBER 6, 7 AND 8, 1910

INNUMERABLE repetitions of tests have shown that the cells as commercially manufactured have surprisingly uniform capacity and that under any similar conditions, no matter how abnormal, different cells will give practically identical results. The same characteristic of constancy of behavior applies also to the different sizes of cell, and at comparative rates they have similar characteristics, except for inconsequential variations in heating due to differences of radiating surface. This is shown in the curves of Fig. 4.

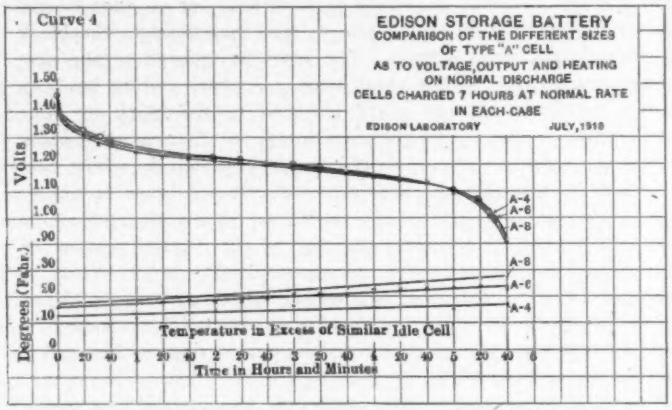


Fig. 4—Showing effect of temperature upon the capacity of the different sizes of battery

In work with the Edison battery the necessity of some reliable and convenient method of analyzing voltage curves, to determine which electrode was limiting the capacity or causing changes of voltage, was early appreciated. The only scheme which had then been tried was the use of the metal container of the cell as a third electrode in the same manner that cadmium is used in lead cell tests. This was a most convenient scheme, but the readings so taken were inconstant and not at all reliable on account of polarization which would be set up at the surface of the nickel-plated steel, even by the infinitesimal current taken by a high-resistance voltmeter.

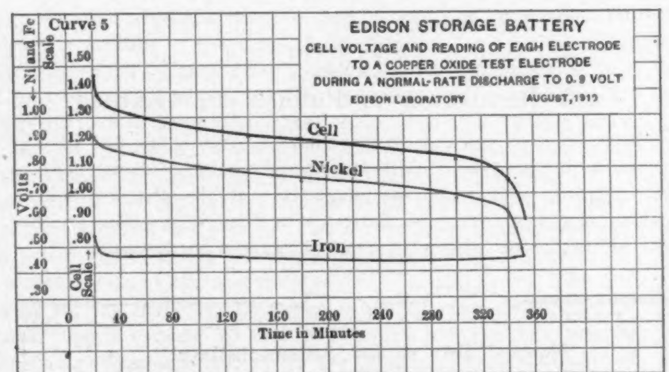


Fig. 5—Cell voltage of the respective electrodes using a copper oxide electrode for testing purposes

The author has devised several successful schemes to the end in view. One of these is theoretically applicable to any kind of primary or secondary battery, and practically also where suitable means exist.

The first device tried was that of a duplicate charged cell standing idle alongside the cell under test and having electrolytic connection with it through an inverted U-tube. Voltage readings would be taken from the positive of the cell under test to the negative of the auxiliary cell, and from the negative of the working cell to the positive of the auxiliary cell. The voltage of an idle charged cell remains practically constant over long periods of time, so variations in the readings thus taken must be caused entirely by the working electrodes, and the resultant curves would show the independent behavior of these. This method proved reliable, but was inconvenient; and in the case of batteries in actual service could hardly be employed at all. The best scheme devised—one which has been used many years at the Edison laboratory and has been successfully applied to various kinds of battery, including the lead storage battery—

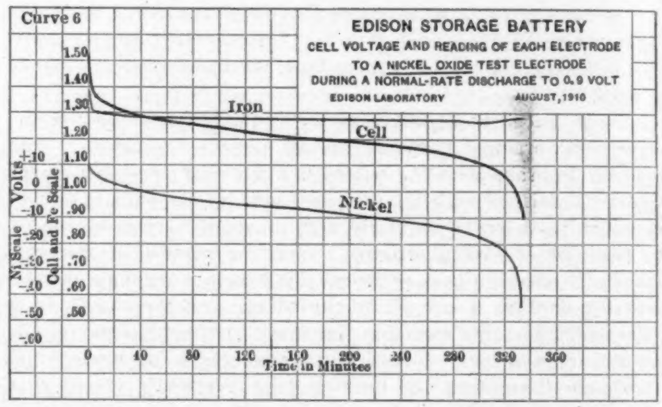


Fig. 6—Cell voltage of the respective electrodes using a nickel oxide electrode for testing purposes

may be described in general terms as follows: The use as a third electrode of a partially reduced oxide which will undergo electrolytic oxidation or reduction in the given electrolyte without polarization. That the oxide should also be insoluble in the electrolyte is of course highly desirable, as its use cannot then contaminate the cell in any way. The oxide must be mounted in a suitable conductive support, and the electrode is preferably encased in perforated hard rubber so that it may be rested on the plate tops with impunity. For the common electrolytes substances fulfilling the above requirements are numerous, but those which the author has found best adapted to use are: lead peroxide for sulphuric acid batteries, and either cupric oxide or the high nickel oxide of a charged Edison positive for all alkaline batteries.

A copper-oxide test electrode can be prepared very easily from a plate of agglomerated cupric oxide such as is sold for use in the Lalande primary battery. A small block cut from a new plate of this kind is bound with fine copper wire and suitably insulated. It is then made cathode, using a passive anode, in a jar of the alkaline electrolyte—a medium current being passed for an hour or so, or until about one-fifth of the block has been reduced to metallic copper. After this treatment the electrode should be allowed to stand in electrolyte for a few days fo "season"—that is, to become stable in voltage. The electrode is

then ready for use and will remain in working condition almost indefinitely, provided it be kept in dilute electrolyte when not in use. If exposed to the air for very long the reduced layer of metallic copper will reoxidize. Cupric oxide is very slightly soluble in strong alkaline solutions; but in the case of the Edison battery it has been found to have no deleterious effect, even when present in large amount, and can be used with perfect safety.

Test electrodes of nickel peroxide and lead peroxide are best made from portions of positive plate of the respective batteries in which they are used. Connection should be made to each by metal of the same kind as that used for support of the active material, and perforated rubber insulation should be provided. These electrodes are prepared for use by fully charging and partially discharging them. They should also be seasoned by standing in electrolyte, as in the case of copper oxide.

Test electrodes of nickel peroxide and of lead peroxide have been found to give excellent results in tests of the Edison and the lead battery, respectively, and have the advantage of being indigenous to those batteries so that no foreign substance is introduced. Peroxide of lead also has the advantage over cadmium of not requiring so much care to keep in condition; its properties do not seem to be affected, even by a drying out in the air.

Fig. 5 shows a normal rate discharge of an Edison cell with independent curves of the electrodes taken by means of a copper-oxide test electrode, and Fig. 6 shows the same taken with a nickel-oxide test electrode. Fig. 7 shows typical nickel-oxide readings for a normal charge.

The fixing of the normal charge and discharge rates and

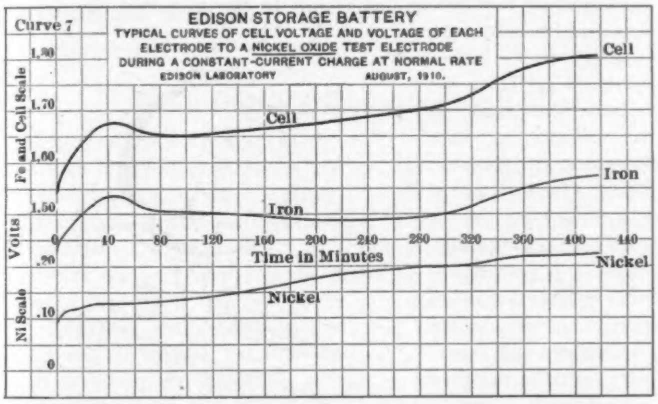


Fig. 7—Typical curve of cell voltage using a nickel-oxide electrode for testing purposes

normal length of charge of the Edison battery is mostly arbitrary. The "normal" current rates given were determined by a careful consideration of the factors of I^2R loss in cell and the resultant heating, of time rates of charge and discharge, and of output; and were presumed to strike the best balance between the governing factors to suit the conditions of vehicle practice. Seven hours is taken as the normal length of a charge at normal rate simply because at this point the output and efficiency were judged to be in the best relation for average practice. These ratings are not obligatory, but the length of charge may be varied between zero and infinity as desired, and should be varied according to the output required in any particular service. The rates of charge and discharge are optional also when just two points are kept in mind. The first is that very low charge rates will not completely reduce—that is, charge—the iron element, and the resultant discharge will be anomalous as to voltage (see Fig. 8). No permanent injury has ever been known to come from low-rate charging, and the discharge will usually recover normal characteristics when the cell is again worked regularly at normal rate. If not, then overcharging at normal rate and discharging to complete exhaustion will certainly re-establish normal conditions. Secondly, it should be kept in mind that although excessive heating does no immediately apparent harm to the battery, continuous working at high temperature will have an injurious effect tending to shorten its life.

What the true ohmic resistance of a storage cell is need not be known; the virtual internal resistance, that is, the factor which is effective in causing internal dissipation of energy, is the value of practical importance. The prescribed method of finding this is to momentarily open the switch at intervals during a discharge and read the electromotive force; then the difference between the value thus found and the potential difference while current is passing would represent the I R drop in the cell due to its effective resistance, and this value divided by the current rate would give the virtual internal resistance at the given point of discharge. This method is hard to apply because when the switch is opened the interruption of current changes the electromotive force to

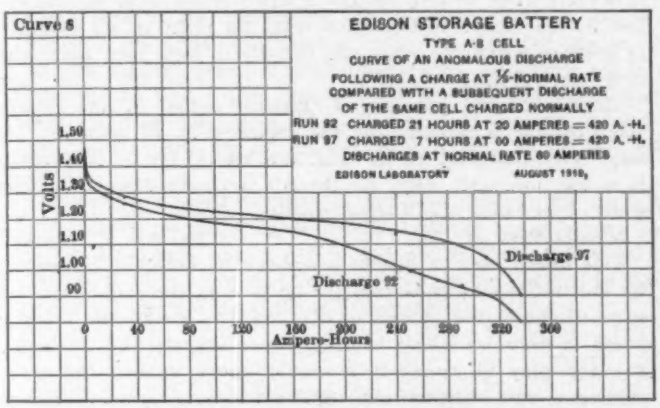


Fig. 8—Curve of an anomalous discharge after a charge at 1-3 normal rate, making comparisons

such an extent that the voltmeter needle continues to rise for some time afterward, and the true value of the electromotive force is very difficult to determine.

A better scheme is to simply reduce the current to a lower value instead of interrupting it entirely, and dividing the difference between the voltages at the two rates by the change of current. Obviously the same result can be achieved through momentary increases of current; and to get the most reliable test the methods should be combined and the current worked both ways on the same discharge. Thus, taking the concrete case of an "A6" cell discharging at 45 amperes, the current should be changed to 15 amperes and 75 amperes alternately for, say, half-minute periods every twenty or thirty minutes. Then the dif-

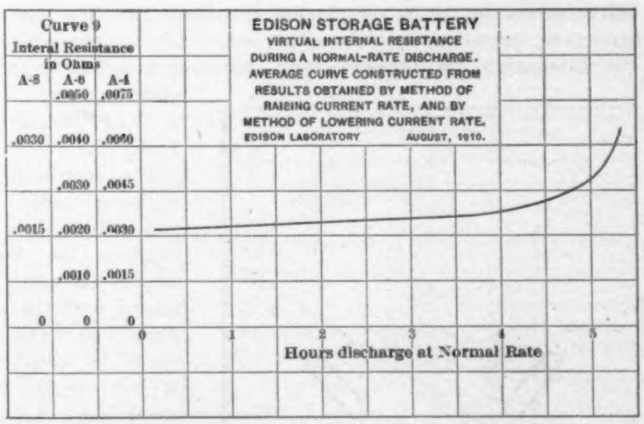


Fig. 9—Showing virtual internal resistance determinations during a normal rate discharge

ference between the voltage at 45 amperes and that at either the low or high rate, divided by 30 amperes would give the true virtual internal resistance for the particular conditions. Fig. 9 is a curve of internal resistance obtained by this method; it shows the average values for an Edison cell discharging at normal rate under ordinary conditions.

Letters

DISCUSSING MATTERS OF INTEREST TO USERS OF AUTOMOBILES; LOCATING ENGINE KNOCKS; TO PREVENT INJURY TO THE LEGS IN ACCIDENTS IN SCUTTLE-DASH CARS; PEINING PISTON RINGS; A REMEDY FOR WORN BRAKE BLOCKS, ETC.

Locating an Engine Knock

Editor THE AUTOMOBILE:

[2,405]—I wonder if you can aid me in identifying and correcting a knock in my engine. The knock is regular, occurring in one cylinder. It cannot be in the ignition, as it is distinctly noticeable after cutting off the ignition when stopping the car; nor in the compression, which tests all right in all cylinders. It is more noticeable when the throttle is well open than when it is nearly closed.

There is also a pronounced "hissing" sound in one cylinder when the car is running and the engine is at all labored. This may have something to do with the knock, but it is doubtful. It is less noticeable when the throttle is closed down than when wider open with the engine running slow.

Mesilla Park, N. M. FRANCIS E. LESTER.

This knock may be due to a number of different causes, and we are inclined to think that the noise is in the cam shaft. On some of the earlier models of this make of motor the retaining screw in front camshaft bearings wore slightly and if there is any end play in camshaft it would knock against the screw, causing a very distinct and regular knocking noise. This can be overcome by discarding the use of this screw and substituting an automatic thrust take up fitted to the front end of the camshaft. This consists of a little bronze boss with ball bearing and spring adjustment. If this is fitted, however, the knock may be due to a ring slap, which can be overcome by slightly slotting the tops of the rings.

In looking for trouble of this sort in a motor it is half the battle to make up your mind that you are going to locate it. If you feel whipped from the start it is a moral certainty that the knock will have the best of you from the start to the finish.

Scuttle Dashes and Accidents

Editor THE AUTOMOBILE:

[2,406]—In the event of an accident to a car that is fitted with a scuttle dash, what possibility is there of the passenger and driver seated in the front clearing the metal covering without injury to their legs? One often hears of accidents where the passengers are thrown clear and coming off with only slight bruises.

G. T. MELSON.

York, Pa.

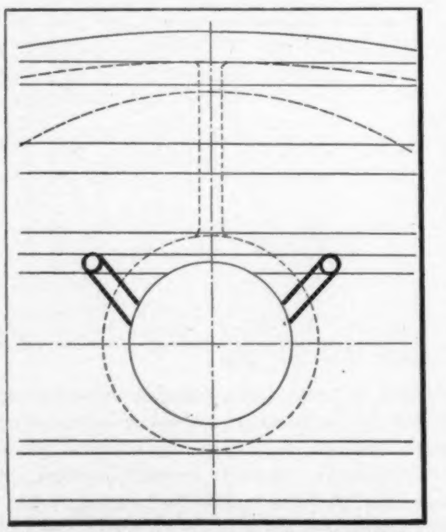


Fig. 1—Method of overcoming insufficient lubrication of wrist pin

The scuttle dash is being used for two reasons—one to improve the lines of the car and the second with the addition of front doors to keep the wind from the lower parts of the body. It would be useful to have a leather pad fitted in the manner shown in the accompanying sketch (Fig. 5); this would soften the impact in case of collision.

A Trio of Pertinent Inquiries

Editor THE AUTOMOBILE:

[2,407]—Being a subscriber of your magazine, I would like to ask some questions:

1. Why does a motor lose power as it is speeded up above 1,800 revolutions per minute?

2. What do you think of a worm-gear drive for a magneto as used on Rutenber motors, the worm being on timer shaft?

3. Which do you think is better, valves on one side or opposite sides? Give reasons. FRED WELLS.

New York.

1. Motor does not necessarily lose power over 1,800 revolutions per minute, as there are several motors that give maximum power at speeds well over 2,000 revolutions, and some over 2,500 revolutions per minute. The maximum speed of an engine is governed by the setting of the valves and the size of the valve seat and outlet ports; as an example, one of the small cars with a 4-inch bore had three exhaust valves to its one cylinder. On engine speed curves of some motors the falling off of power indicated by the falling line is due to the fact that the speed is too great to allow the charges to be either properly gotten to the cylinders, weakness of mixture, or back pressure of the exhaust. It is supposed that the ignition is correct, although, while it is possible to obtain instruments to fire at, say, 3,000 revolutions per minute, some do not give satisfactory results above a certain speed, and this can only be determined by trying out several different makes.

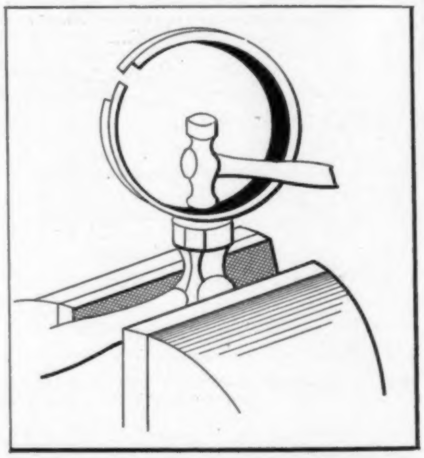


Fig. 2—Showing method of peining piston rings

2. The worm gear for magneto drive is equally as good as the straight-tooth type, with the advantage that it is quieter, and the backlash occasioned by the armature leaving the magneto suddenly could be better taken care of with a worm.

3. As to which is the best is a matter that depends upon how the motor is made; or, better still, how well it is made. The type you do not mention, viz., the overhead type, obviates all pocketing, which is bound to occur to some degree, no matter how small in the "L" or the "T" type of motor.

Another Tip on Piston Rings

Editor THE AUTOMOBILE:

[2,408]—With reference to your recent replies on piston rings and the method of peining same, I have heard it said that they should be struck from the inside. As I should like to try this method, could you tell me how it is done? TYRO.

Wilmington, Del.

The accompanying sketch (Fig. 2) will show you the method employed, as in the case where a blow is struck externally care must be exercised in hitting a fair blow.

To Remedy Worn Brake Blocks

Editor THE AUTOMOBILE:

[2,409]—I am troubled with the brakes on my car, as after adjusting them to the full extent they will not hold the car on an incline. The car is of foreign manufacture, and the agents say it will take some time to obtain the part from the factory if I wish to order new shoes. How can I use the old shoes?

Georgetown, D. C. MARK BALDWIN.

First of all, you do not say if the shoes are of an internal expansion or external contraction type of brake. The latter can be fitted with new liners made from cast iron, copper or hard brass, but the former can be remedied by filing the places where the opening block touches and fitting two new pieces of steel, as shown in Fig. 4, so that when the wheel is put on again and the brake rods are set at the smallest amount of adjustment possible the brake will start to operate, and your trouble will be ended.

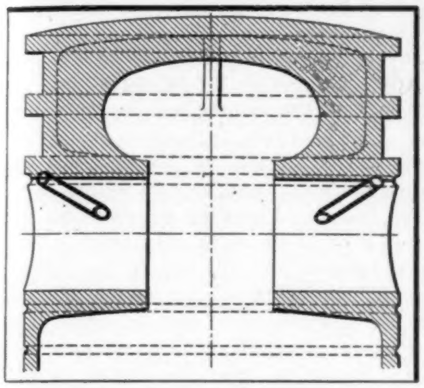


Fig. 3—Showing holes drilled through flanges of piston

Removing Carbon from Cylinders

Editor THE AUTOMOBILE:

[2,410]—Will you please inform me as to the best method of removing carbon from cylinders by the use of kerosene? I have had trouble with the carbon fouling the valves when blowing it out after using kerosene. Will you kindly tell me how much to use in each cylinder and the best way to get rid of the kerosene after using? I have put cocks only in the tops of the cylinders.

Also, do you recommend pouring kerosene in the air intake of the carbureter for the purpose of removing carbon instead of pouring the kerosene in the tops of the cylinders? Also, should a small quantity of lubricating oil be put in the pet cocks in the tops of the cylinders after using the kerosene?

I am a subscriber to your paper, and your courtesy in answering these questions will be much appreciated.

Newark, N. J. H. J. BRADLEY.

To remove carbon by injection of kerosene in the cylinders is at the best a makeshift method of removing this objectionable foreign matter. A method that has given satisfaction is as follows, if the valves are not placed in the head of the cylinder:

Turn the engine so that the pistons are on a dead level, and pour through the pet cocks or valve plugs sufficient kerosene to cover the pistons about one and a half inches and allow it to remain all night. A good quantity by the morning will have found its way past the rings into the base chamber. Now take out the exhaust valves and exhaust manifold and turn the engine several times to allow any remaining kerosene to be expelled; turn the engine so that the piston is in position. If you have no such implement, make or purchase a carbon-removing tool, and through the exhaust valve plug or outlet port, if it is placed conveniently, rake out the carbon, which will be soft. The next operation is most important, and it is upon the care with which this is done that the success of the whole operation lies. It will be understood that the inlet valve has not been touched. Take the inlet valve plug out, and what it was impossible to reach from the exhaust side should be pushed toward the latter. Wash out with kerosene from the inlet plug to the exhaust by means of a syringe, and finally with a mixture of kerosene and gasoline, half and half, clean out with some fresh rag, but always see that the inlet valve of the cylinder that is being worked upon is closed. It is advisable when the pet cock is placed in the head of the cylinder to remove same and pass a wire down it, as the orifice often becomes clogged with carbon, and although the piston and cylinder are clean the carbon in the cock becomes incandescent and causes preignition. It is preferable to pour the kerosene into the cylinder direct rather than to take it in by way of the induction pipe.

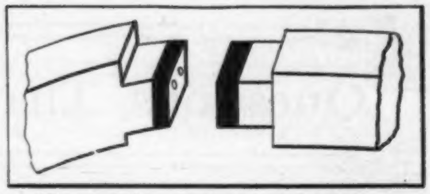


Fig. 4—Worn brake blocks repaired

As regards the lubricating oil, the base chamber should be emptied and fresh oil inserted before running the engine, and, as you suggest, insert a small quantity of lubricating oil in the cylinder as well. This can be done through the valve covers, first allowing the piston to go below half-way down, and by this means pour the oil on the walls instead of on the piston head.

Inserting a small quantity of kerosene through the pet cocks after every 300 miles should help to keep the engine clean. Some piston heads are turned rough, and will pick up carbon quickly. If this is so in your case much trouble can be avoided by taking them out and having them polished smooth.

Lubrication for Wrist Pins

Editor THE AUTOMOBILE:

[2,411]—I have a four-cylinder car that has recently developed a knock, and the other day I took the engine down and found that the wrist pins had worn perceptibly, and showed signs of scoring, as if they had not sufficient oil. Lubrication is by pump to maintain a constant level, and the walls of the cylinders and the wrist pins are dependent upon splash. Is there any method you can suggest to lubricate the new wrist pins to prevent them going like the original set? J. W. L.

Philadelphia, Pa.

If the hole in the top of the connecting rod is not large enough the following method ought to cure your trouble: As Figs. 1 and 3 indicate, drill the pistons through the inside flanges or webs and turn a small slot to catch the oil, and on the upward stroke it will find its way to the wrist pin.

There should be oil slots cut in the bush in the connecting rod, otherwise oil cannot find its way in to lubricate the pin. The pins should be turned a few 1,000ths larger than required, case hardened and afterwards ground to the required size.

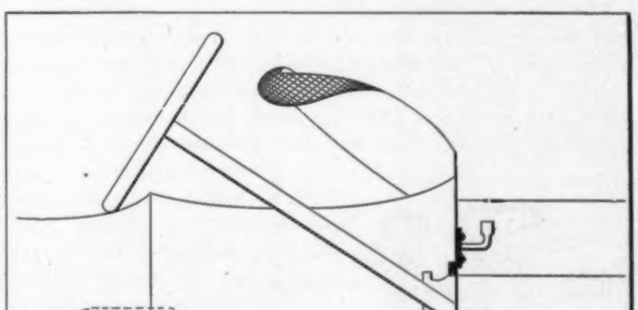


Fig. 5—Leather protection for torpedo dash

Questions That Arise

CONCERNING PUMPS FOR MAINTAINING PRESSURE IN THE GASOLINE TANK; SPANNER FOR INACCESSIBLE NUTS; TO START A CAR IN COLD WEATHER; CLEANING ACETYLENE GAS BURNERS

[254]—What is the specific gravity, weight per cubic inch and weight of aluminum compared with cast iron and copper?

Specific gravity pure aluminum in cast state is 2.58; weight per cubic foot, 0.092 pounds; weight compared with wrought iron, 1:2.90; as to copper, 1:3.60.

[255]—What style of pressure pump is there in use which does not require a relief valve for keeping pressure in the gasoline tank?

The accompanying sketch (Fig. 1) shows a section of a hollow plunger pump operated by a cam from the half-time shaft. When the plunger is forced upwards air contained in the upper enclosed chamber is compressed until the highest point is reached, when a small port is uncovered, forcing the gases past a ball valve acting as a non-return. The contained air, which, owing to the capacity of clearance space, cannot exceed a pressure of 4 pounds, does away with the necessity of the safety valve.

[256]—What is the condenser on an induction coil?

A number of sheets of tinfoil laid together with thin oiled or varnished paper or other non-electric substance between them. The ends of alternate sheets of the foil are connected together and two groups of interlying sheets are thus formed. These become charged with electricity when the current is interrupted and when the circuit is closed again the electrical energy stored is quickly given out.

[257]—Can a spanner for inaccessible nuts be made?

A method employed by some mechanics (?) is to take a chisel and hammer and strike a few blows on the nut side to loosen it when it is stiff. This method cannot be too strongly condemned. If a nut is inaccessible and has to be taken off from time to time it is better to make a spanner to fit it and with one such as shown in Fig. 2 the hammer and punch can be used *ad lib.*, as it is the correct way to use this spanner.

[258]—When should the inlet and exhaust valves begin to open and when should they close?

This is a matter that has been differently handled by different makers, and a great amount of variation is found in the opinions of eminent designers of gasoline motors. Taking the inlet valve first, in some cases this is made to open when the piston is on the dead center, others with a seven per cent. advance, and again with as much as 14 degrees retard, or the valve does not open till the piston has traveled 14 degrees down on the suction stroke.

The time of closing cannot be altered on any particular car once the opening has been set, as this is controlled by the profile of the cam. In two different motors where the inlet valves open 13 and 14 degrees late respectively the closing of the former takes place 10 degrees after the piston has started on the upward compression stroke, while the latter does not close till the piston has arrived at 35 degrees of its upward stroke, allowing that 180 degrees is the equivalent of one whole stroke, and not one revolution.

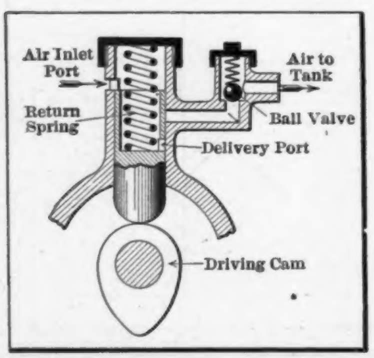


Fig. 1—Air pump for pressure for gasoline tank

With regard to the exhaust valve this is usually made to close almost immediately the piston starts on the suction stroke, but slightly over the dead center, and it is on the closing of this valve that the timing must be set and not on the opening, which may vary from 10 to 50 degrees on the explosion stroke. From the foregoing it will be seen that the inlet valve must be timed by its opening and the exhaust on its closing.

In some motors the inlet valve opens before the exhaust has fully closed and in case of doubt or if the timing wheels are not marked, communication with the makers will be the easiest way out of the difficulty.

[259]—What is the best way to start a car that has been laid up for some time, or refuses to start owing to cold weather?

Do not fly to the usual remedy of pouring gasoline into the cylinders by the compression cocks or spark plug holes if it is stiff. The cause of the stiffness is probably due to the dryness of the cylinder walls, as the lubricating oil has either dried up or found its way back to the base chamber. Mix an equal quantity of kerosene and lubricating oil together and inject same into the cylinder and with the spark off turn the engine several times to allow the mixture to percolate past the rings and so lubricate the walls. Injection of gasoline will aggravate the trouble of dryness and render the compression weaker than it already is, and it is due to the poor suction on the carbureter that a mixture strong enough cannot be gotten to the cylinders to ignite and start the motor. If, after the lubrication treatment has been applied the motor refuses to start, then a small quantity of gasoline can be used. In Winter the cold may have the effect of partly solidifying the lubricating oil and in this case also kerosene is a better remedy than gasoline to liquefy it.

Holding a heated rag over the carbureter and induction pipe may be resorted to if a coating of ice forms on the outside of the pipe. Once the engine has been started it is better to allow it to run for a few minutes before starting to run the car.

[260]—Is there any means of cleaning lamp burners for acetylene headlights that have become clogged?

Soak the burners in nitric acid and afterwards hold them in the flame of a Bunsen burner. Clearance may be effected by a piercer of exact size, but this is difficult to obtain and the matter from which burners are made being very brittle, extreme care should be exercised.

French Makers Alarmed at Importations

Alarmed at the success attained by the importers of foreign cars, and the numerous victories of foreign cars in speed and hill-climbing contests, the French manufacturers have voted in favor of some big demonstration for the year 1911. The nature of the demonstration has not been decided upon, but it is understood that the French manufacturers have in mind a big road race or an important touring competition. The race is more likely to be adopted than the touring competition, for European manufacturers are of the opinion that definite racing restrictions, whether they be limited bore, limited fuel, or a weight restriction, have more influence on the breed of automobiles than the most trying touring competition that can be devised. The movement in favor of the "demonstration" has taken the form of a recommendation from the Chambre Syndicaee de l'Automobile that the Automobile Club of France should take this matter in hand for the 1911 season.

Fig. 2—Spanner for inaccessible nuts

Digest

EXTRACTS FROM CONTINENTAL JOURNALS ON SUBJECTS ALLIED TO AUTOMOBILE ENGINEERING: CAST IRON STRENGTH AND SPECIFICATIONS—THE SABATHE KEROSENE MOTOR—THE RISE IN BENZOL

Specifications for cast-iron parts have only of relatively recent date been subjected to regulations of recognized value and this has been one of the reasons for discrediting castings as parts in automobile construction, their strength being difficult to determine in advance. The reason why practice and science have refrained from formulating basic rules for deciding the strength and properties of cast-iron parts, even though foundry science has progressed by leaps and bounds, is to be sought in the fact that the unit strength of a casting, even in the case of comparison between materials derived from the same ladle, depends largely upon the dimensions of the piece and the more or less rapid cooling to which it has been subjected. The same difference arises with regard to a single cast piece, according to the direction and location of the stress. The strength along one cross-section varies from the strength through another section, and the difference is not pro rata with the dimensions. Slow cooling, as where the diameter is greatest, produces a coarser structure and also causes carbon to be precipitated as graphite between the walls of adjacent crystals, greatly reducing strength. Flexion tests made by O. Leyde with bars of square section of different dimensions and all cast in one piece with a heavier bar uniting them across one end, showed that the softest iron developed the most pronounced differences in unit strength, in favor of the bars of small section. A bar 10 by 10 millimeters in section endured a stress of 47 kilograms per square millimeter, while a bar of 150 by 150 millimeters cross-section endured only 18 kilograms per square millimeter. In three series of tests the materials differed mainly in silicon, this metalloid running from 2.1 per cent. in the hardest to 1.5 per cent. and 1.2 per cent. in the softer grades. The composition otherwise was carbon 3, phosphorus 0.6, manganese 0.7 and sulphur 0.12. Similar results were reached in tests by Sulzer Winterthur Brothers with bars from 5 to 50 millimeters in diameter, giving a strength decreasing from 63 kilograms for a bar of 5 millimeters diameter to 27 kilograms for the largest size. The Society of German Iron Foundries has now created regulations for cast-iron tests in which the principal source of error in previous rules—the use of only a single dimension of bar—is eliminated. The new regulations distinguish between: A, machine castings of (1) medium, (2) high and (3) very high strength; B, architectural and construction castings, and C, pipe castings, comprising (1) gas and water pipe and (2) steam pipe. Each subdivision is further divided according to dimensions of the casting in three classes: (1) Pieces with walls up to 15 millimeters thick, (2) between 15 and 25 millimeters and (3) average wall thickness of more than 25 millimeters. Further regulations extend to shapes, properties of the material and method of producing test bars. In addition to flexion tests here is provided test by internal hydraulic pressure for tubular castings. The testing work which was called into action by these regulations at the various foundries has created a demand for a special machine for facilitating the measurements, and one such has been produced by the Düsseldorfer Machine Company, Inc., and is provided with automatic stress-measuring instrument and recording manometer giving direct reading in kilograms.—*Metall Technik*, August 6 and 13.

The construction of the Sabathe kerosene motor, mainly intended for boats, which was described in this column last week, is shown in Fig. 1. *A* is the admission pipe, *E* the exhaust pipe, *C* the camshaft from which are operated the valves and the kerosene injection pump *G*. *D* represents four rings made of anti-friction metal and placed below the piston rings to insure rigidity and tightness and avoid danger of fire from gas leaks. One similar ring is placed above the piston rings. Note the mounting of the cylinder in the jacket, by which it becomes possible to turn the cylinder around its axis and avoid ovalization.

Each ton of coked coal yields 3 to 5 kilograms of rectified benzol. The annual French production of 32 million tons of coal offers a sufficient supply of automobile fuel. At present France consumes 50,000 tons of benzol annually. The new industry of producing it was begun in 1896. First the mines in the North, especially those at Lens and Anzin, which are engaged in the production of coke for the steel furnaces, installed new apparatus for recovering the by-products, viz., coal tar, ammonia, benzine, benzol, toluene and heavy oils. France was far behind Germany in this respect. The consumption of benzol was then only a few hundred tons per year, in France, and the price was high, reaching 100 to 200 francs for 100 kilograms. The principal employment of the substance was for dyeing and similar small chemical industries. After the first installation of benzol-producing apparatus there was a sharp decline in the price, due to overproduction. But in three or four years the demand more than caught up, and in 1901 new installations were made. The mines at Aniche, Escarpelle, Bethune, Dourges, Douchy and the Société Lorraine de Carbonisation began to produce benzol. Prices at once dropped again. There was a lull in production. Suddenly the gas engineers took up the idea of using benzol, which has a very high illuminating value, for the enrichment of illuminating gas, and it also began to be employed as fuel for stationary motors, and prices again rose to 40 and 50 francs per 100 kilograms. Finally the automobile movement gained strength. England turned to the production of benzol and makes now 35,000 tons per year. Belgium produces 6,000 tons, and Germany 70,000 tons. At the present moment France produces 13,000 tons and uses 50,000 tons of benzol, a large part of which comes from Germany. The anomaly has arisen, says M. F. Laur in *Journal du Pétrole,* that German benzol competes duty-free in France against American, Roumanian and Galician gasoline on which an import duty of 12.50 francs per 100 kilograms is collected, thus reducing the State revenues about 5 million francs, while at the same time free-trade England has imposed a tax of 3 francs per 100 kilograms on motor fuels, with especial view to the exclusion of German benzol. Rectified and washed 90 per cent. benzol sells now for 13 to 19 francs per 100 kilograms, f. o. b. Paris (city excise not included), while gasoline costs 30 to 33 francs. A rise in its price seems imminent.—*La France Automobile,* September 3.

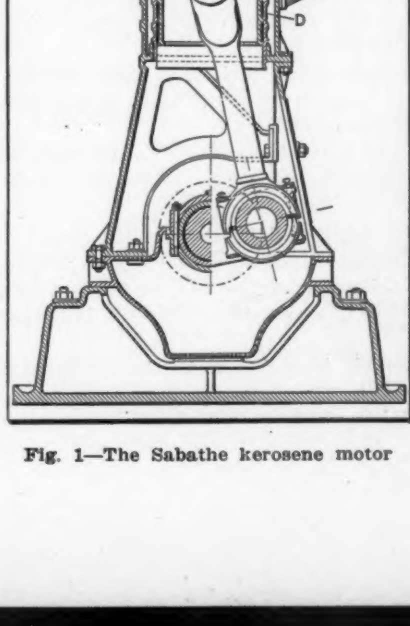


Fig. 1—The Sabathe kerosene motor

Injunctions

Don't fiddle on one string; the noise is dreadful; the string is sure to break.

Don't tell about what you are going to do—go do it.

Don't pray to the Lord for a chicken dinner and take that as a license for you to rob a hen roost.

Don't jolly yourself into the idea that robbing a hen roost differs much from overcharging an autoist who entrusts you with the repair of his automobile.

Don't obligate yourself with promises to deliver more automobile than the kind that you are selling represents; the purchaser might hold you to it.

Don't pray to the Good Lord to come and relieve you of your earthly burden and then say that you are out when the Lord knocks on the door.

Don't burden yourself with a load that you would like to palm off on the Lord—if you will only play fair with the automobiling public the sunshine of prosperity will gladden your soul.

Don't grow corns on your tongue telling every person whom you can buttonhole how you scalped a farmer's chicken—you would squeal like a stuck pig were you to drop a sou in a crap game.

Don't listen to a knocking demonstrator; while he is riveting your attention to the failings of a competing make of car he is leading you away from the good qualities of the automobile that he is trying to fasten upon you.

Don't loan money to the character of man who would hold you so lacking in acumen as to listen to him while he tells you how bad the other make of car is—he is a biased advocate, and he is so hungry that he would charge you interest on any money that you might be foolish enough to loan him.

Don't saunter around Automobile Row making believe that you are about to invest in an automobile, only that you are having difficulty in finding one that is good enough for you—just go home; bewilder your wife by displaying a little sense; besides, she may be in need of the car-fares that you are squandering in a futile attempt to disguise a pouter pigeon—it can't be done.

Don't start out to buy a car by telling the maker all about how you think it ought to be made; it would require as much time in relating what you do not know about automobiles as it would to describe the clothing that a South Sea islander does not sport.

Don't approach a prospective with the solemnity of an undertaker; he may not feel sure that there is a vacancy in Heaven; be cheerful.

Don't murder a prospective's resolve to join the ranks of autoists; if the automobile you have to offer does not check up with his requirement, direct him to the place where he can get it—you know.

Don't fail to lubricate the springs; this is a simple thing to do; pry open the leaves with a screwdriver and squirt a little lubricating oil in between them.

Don't put up with a strange noise; if it is noticed get out a search warrant and serve it upon the pest; it will grow and prosper if you disregard it.

Don't imagine that a noise is too insignificant to pay attention to; it means that there is something the matter; have it fixed.

Don't assume that membership in a club, even if it is a large one, gives you any right that is not enjoyed by other autoists when it comes to driving an automobile on the highway; the mantle of the law is supposed to cover all with equal protection.

Don't forget that membership in a club multiplies the loudness of the voice for good by the number of the members if all pull together—pull in unison, that is the wise course to pursue.

Non-Freezing Solutions

GRANTING that there is very little trouble from freezing water in automobiles when the motors are in more or less constant use or stored in a garage that is kept fairly heated, the fact remains that the cylinder jacket water will freeze up if automobiles are in an unheated garage, or if they are stood out in the cold all day without running the motors to maintain a state of warmth sufficient to prevent the water in the circulating system from reaching the freezing point, which is 32 degrees Fahrenheit. Experienced autoists understand this situation quite well, but those who are newcomers may not realize that the very efficiency with which radiators serve their intended purpose constitutes a source of danger, due to the ease with which heat is transferred from the water to the surrounding atmosphere.

What is true of the water that is circulated to maintain the cylinders at a working temperature is equally to be said for the water that circulates through the carbureter for heating purposes, it being the case that the water first goes to the cylinders, where it is heated, and some of it then passes into the carbureter jacket, where its heat is abstracted from it by the gasoline which, being something of a refrigerant, tends to lower the temperature and the heat from the water overcomes this difficulty. But when the motor is shut down and there is no means of maintaining the heat in the water, it is then under the influence of the surrounding temperature and, on account of the efficiency of the radiator and other parts for the transfer of heat, it is but a matter of a short time when the water will be so reduced in temperature that it will freeze.

There are a number of ways of preventing water from freezing, as when some foreign substance is placed in solution. Of the several materials that are used for this purpose some of them are not recommended, due to the fact that they will either foul up or attack the metals with which they will contact as the water holding these elements in solution is circulated in contact with these metals. Common salt is used in refrigerating work on account of its ability to take up a large amount of energy in the form of heat at low temperatures without freezing. In this class of work, in view of the corroding action of the salt, nothing but iron is used throughout, but in radiators and the piping system of automobiles there is more than iron, and salt is therefore debarred from use.

Calcium chloride is available to some extent; it must be chemically pure, however, and this is a difficulty that is not easily overcome owing to the danger of not being able to procure chemically pure calcium chloride with absolute certainty. For those who care to experiment with this material for non-freezing mixtures, the table as here given for its properties will afford the requisite data from which to make a solution that will suffice for the coldest Winter work in the latitude of New York.

One of the safest solutions to employ is made up of water and glycerine. The proportions of glycerine to water for the various temperatures may be determined by consulting the table as here afforded, for which THE AUTOMOBILE is indebted to Messrs. McKesson & Robbins, New York City.

There still remain the various solutions of alcohol and water, using either wood alcohol or the denatured product, which is sold under the trade name of "Pyro-Alcohol." In any event, using alcohol, it is necessary to test the cooling solution at frequent intervals in order to determine its strength and to replenish the alcohol as often as may be necessary to maintain the strength of the solution, compensating, of course, for the part of the alcohol that evaporates off. Just how often it will be necessary to re-establish the strength of the alcoholic solution depends upon the

CALCIUM CHLORIDE MIXTURES; GLYCERINE IS RECOMMENDED; WOOD ALCOHOL MAY BE USED; DENATURED ALCOHOL IS POPULAR

efficiency of the cooling system and the amount of boiling off that takes place in regular service.

SOLUTIONS OF WOOD ALCOHOL AND WATER FOR MOTORS

Percentage of wood alcohol	Freezes at Degrees Fahrenheit	Specific gravity
5	25	.994
10	17	.988
15	10	.982
20	5	.975
25	—3	.969
30	—10	.963

Note.—The specific gravity of alcohol or other solutions may be determined by means of a suitable hydrometer. For alcohol there are special instruments of this character to be had.

SOLUTIONS OF GLYCERINE AND WATER FOR MOTORS

Per cent. glycerine	Freezes at	
	Deg. Cent.	Deg. Fahr.
10	—1	30
20	—2.5	27
30	—6	21
40	—17.5	0
50	—31	—25

Note.—Up to 30 per cent. glycerine can be used without material effect on the rubber hose connections, but if a stronger proportion is used the connections will have to be renewed frequently. No matter how little glycerine is added to the water the mixture will after some time become muddy and must be thrown away and a new solution made to replace the old.

CALCIUM CHLORIDE SOLUTIONS FOR MOTORS

Percentage of calcium chloride	Freezes at Degrees Fahrenheit	Specific gravity
5	27	1.04
10	22	1.08
15	15	1.13
20	about 0	1.18
25	—10	1.22

Note.—The best way to make the solution is to make a saturate solution of the chloride and then use this, by adding water to it till the required mixture is reached. This is done by taking half a gallon to 8 pounds of chloride for each gallon of saturate solution desired. You can tell if it makes a saturate solution by the fact that some of the crystals will remain in the bottom undissolved. It is advisable to add to this solution a handful of lime to render it alkaline. This latter is done, as it is said that this solution has an acidic action on the metals of the whole cooling system, setting up an electrolytic action.

SOLUTIONS OF DENATURED ALCOHOL AND WATER FOR MOTORS

Percentage of alcohol	Freezes at Degrees Fahrenheit
10	25
20	12
30	—3
40	—20
50	—35

[The figures given are from the United States Industrial Alcohol Company.]

The volume of the mixture of alcohol and water does not remain the same as their combined addition. This is due to the fact that gases that are held in the liquids separately are less soluble when the two are brought together and the contraction described is the result of the disengagement of such gases.

5	per cent.	alcohol	in	water	0.31	contraction
10	"	"	"	"	0.72	"
15	"	"	"	"	1.20	"
20	"	"	"	"	1.72	"
25	"	"	"	"	2.24	"
30	"	"	"	"	2.72	"
40	"	"	"	"	3.44	"

Automobile Trade Directory Just Out

The Automobile Trade Directory for the current quarter has just been issued and in some respects the work is more complete than ever before. It contains 808 pages, of which considerably more than half are devoted to classified text covering every branch of the trade, the remainder being occupied by a selected list of advertisements. In addition to the ordinary indices the directory contains thirteen pages of cross references touching 2,125 subjects.

Instructions

Should the magneto fail to properly perform its functions the fault may be due to:

(a) Lack of protection.
(b) Second-thought installation.
(c) Poor wiring.
(d) Inferior spark plugs.
(e) Improper timing.
(f) Lost motion in control system.
(g) Weak magnets.
(h) Defective insulation.
(i) Loose electrical connections.
(j) Open circuit.
(k) Excess of lubricating oil.
(l) Bad alignment.
(m) Defective bearings.
(n) Worn out brushes.
(o) Pitted collector rings.
(p) Poor ground connections.
(q) Static discharge.
(r) Induction interference.
(s) Defective design.
(t) Mechanical interferences.
(u) Unequal polar gaps.
(v) Magnetic leakage.
(w) Loose driving gear.
(x) Loose spindles.
(y) Loose magnets.
(z) Faulty switch.

Remedies for Magneto Troubles

(a) Fit leather or vulcanite cover.

(b) Take down and reinstall properly.

(c) Poor wiring always spells trouble; fit new.

(d) Inferior plugs are worse than bad wire; the best for magneto is not too good.

(e) Retime; if you are not sure ask some one who is.

(f) Take up slack, and keep connection oiled to obviate wear.

(g) Have them remagnetized.

(h) This is sometimes difficult to locate; after you are sure it does not lay in the wiring or bedplate, send the magneto to the makers if the mechanic handy does not thoroughly understand magnetos.

(i) These should be looked to often, and where possible fit lock nuts.

(j) Go over switch to find fault.

(k) If it has not got in the armature clean all parts and use less oil often and little rather than a lot now and then.

(l) Causes wear quickly if sideways; make holes for holding bolts larger; if too low pack up with thin fiber.

(m) Have them rebushed.

(n) Fit new ones.

(o) Clean with gasoline, or if badly worn use very fine emery paper.

(p) Undo same, wash with gasoline and clean with emery paper; if the spot is likely to be covered with oil make new connection elsewhere.

(q) Close safety gap slightly.

(r) Caused by law or improper windings; have same repaired.

(s) Outside owner's power.

(t) Readjust the parts so that they clear.

(u) Take out all plugs and adjust them all to one gauge of between 1-32 and 1-64 inch.

(v) Avoid a magnetic short-circuit by keeping the magnets clear of iron brackets, etc.

(w) If key is worn, have new key cut and keyways cleaned; if pinned to shaft, ream holes and fit larger pins.

(x) Have shaft turned true and rebushed to accommodate same.

(y) Tighten up holding screws.

(z) Repair same, but if cracked it is better to fit a new one.

Electric Vulcanizers

DISCUSSING THE NECESSITIES OF TIRES; STATING HOW REPAIRING MUST BE DONE; ILLUSTRATING AN ELECTRIC VULCANIZER, AND THE TOOLS THAT ARE NECESSARY

RAW RUBBER, while it is sticky and has certain cementing properties, is lacking in permanence in this regard. The adhesive properties of the rubber may be compared to molasses under temperature changing conditions. When the weather is cold the molasses will stick like flypaper, but as the temperature is raised the sticking properties of the molasses fall away until at a high Summer heat it will run like water. Raw rubber has properties that are not possessed by molasses and it is on this account that it is found to be of value in tire making; rubber is waterproof; molasses is not; in fact, it dissolves in water. Now, while molasses is thinned by heat, rubber is hardened; here is another distinct difference. The rubber may be so altered in its chemical composition, or better yet, characteristics, that, when it is diluted with sulphur or other suitable substances, it will not only harden under high temperatures, but it will thereafter remain so. If it is desired to keep the rubber from hardening too much, all that has to be done is to use less of the sulphur, or other vulcanizing substances, and regulate the vulcanizing heat to that which is known to produce the desired result.

Now, rubber is used in tire making for the purpose of sticking the layers of fabric, one to the other and all together. It is also employed to seal up the cotton, of which the fabric is composed, in order that mildew and other rotting agents may be locked out. In addition to the performance of these functions, the rubber is employed in a compound to make a toughened tread for the tire, so that when it rolls over the rough ground, contacting with sharp stones and other impediments, the fabric will be protected, it being the case that the toughened tread of rubber compound is better for this purpose than any other material that is now sanctioned for use, excepting, of course, that there are special forms of treads that do good work, and they are frequently used in conjunction with rubber for the accomplishment of this end, notably leather treads.

At all events, the rubber does several things, none of which is of the character that popular belief seems to accord to it. True, rubber is a resilient material, and that a rubber ball will bounce is too well known to be denied. The fact remains that it is the air in the pneumatic tire that is given the privilege of doing the bouncing part, and it is understood by those who have studied the matter, that air, under pressure, is far better than rubber for all such purposes, as cushioning the blow.

Leaving it to air, then, to do the work of dampening the blow and serving as springs for the automobile, it remains to emphasize the part that rubber plays in tires, and right here it will be well to mention the fact that this strange material, in addition to being waterproof, is airtight; inner tubes will hold air under pressure because the walls are of such fine texture that air, even under pressure, leaks through very slowly indeed.

If it is understood just what part rubber plays in tires it will be possible to discuss the care of them, with the hope that the needs of the occasion will be appreciated. The strength of the tire resides in the cotton fabric; this strength will prevail as long as the fabric is protected from its enemies, they being mildew, rust, acid, grease, dirt, and mechanical efforts, as flexure, centrifugal strains, excessive loading, and abrasion or cutting.

Disregarding the mechanical strains for the time being, since they are secondary to the present point of view, it remains to discuss the points that rubber is mostly concerned with. It will be seen that anything that will keep mildew away from the fabric will also bar out everything else that will not serve as a solvent for the rubber compound. Unfortunately, some of the substances that come into contact with the rubber will dissolve it; among these solvents grease is the material that is most likely to be encountered, although it is well known that dishonest chauffeurs, when they want to collect commission on new tires, put gasoline in the casings, and this liquid soon eats away the rubber compound, exposing the fabric, which the gasoline helps to rot out in a short space of time.

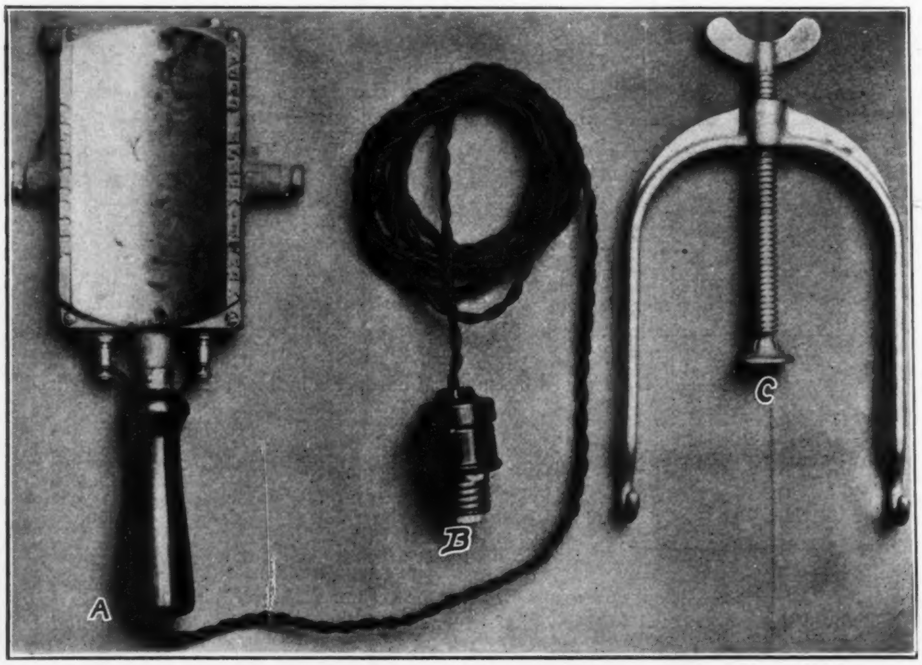


Fig. 1—A, vulcanizer; B, plug to screw into electric light socket; C, clamp for holding the vulcanizer to the tire

But the rubber, as long as it is kept in perfect condition, does ward off all honest natural enemies, as mildew, dirt, etc., and if the rubber can be kept in perfect condition, the tires will last for a long time. But this is the difficulty; automobilists, while they kick like the dickens at the tire bill, fail to appreciate the needs of the occasion, and, instead of healing up the little blemishes on the surfaces of the outer casings before they begin to fester, they wait until the cotton fabric, which, as a wick, pulls in a vast amount of water, and with it a horde of mildew, is all eaten away, sometimes for a foot or more away from the surface blemish that is responsible for the damage.

Just how large an opening will have to be to allow the cotton fabric to "wick in" water and mildew, that is ever in solution, is a matter which autoists differ about, but it is a moral certainty that the water and the mildew are content with a very minute opportunity. With such an active, though natural enemy, it is no wonder that there are

so many dissatisfied automobilists, and there are as many of them as there are careless men who use automobiles and let them go to the dogs.

Since tires are very expensive, and none too lasting under the best of conditions, why is it such a large undertaking to do the small amount of work that will make them wear perhaps three times as long, as they will when they are neglected.

In the repair of little wounds—remembering that they are more dangerous than big cuts because they may be left unattended to for a month or more, whereas big cuts will compel immediate attention—assuming that the tire is cleaned with tepid water and castile soap to begin with, it remains to swab out the wounds and open them up a little, if necessary, preparatory to the application of the desired amount of the proper grade of cement to be used for this purpose.

The best cement to employ is not to be arrived at by just going to the nearest bicycle store and buying a tube of rubber cement. Each make of tires on the market has some proportion of rubber compound that differs from the other, and the right cement to use is that which will stick to the particular compound of which the rubber of the tires is composed.

Having procured the proper grade of cement for this purpose and having applied it to the cleaned and enlarged wound, it still remains to vulcanize the patch, if such it might be called, ere the new rubber will adhere and remain permanently attached to the old.

There are various types of vulcanizing appliances to be had; some of them are large and cumbersome, depending upon the heat from steam, under pressure, to afford the desired warmth; this class of vulcanizers is used in the plants where tires are made; room and bulkiness are not important factors there, but in the owner's garage it is scarcely to be supposed that a steam vulcanizer would lend facility to the plan. Electric vulcanizers, under the circumstances, are looked upon with much favor, and, since they afford the desired amount of heat at the right temperature, if they are properly designed, all that remains is to procure and use them with the assurance that the tire bill will be very materially reduced, provided, of course, that the work is promptly done.

The principle of the electric vulcanizer is that of the electric heater or rheostat. It is made up of a shell of metal as shown in Fig. 1, holding a set of electric conductors, they being relatively high in resistance. When the electrical energy is connected to the vulcanizer through wires leading from a proper source, as an electric light wire of the right voltage, by attaching the two wires to the binding posts of the vulcanizer, the electric current that will flow through the resistance wires, as they are

Fig. 2—A, folding case; B, brush; C, pliers; D, hook; E, skiver; F, marker; G, shears; H, roughener

called, will deliver up its energy in the form of heat, and the amount of heat generated will be sufficient to raise the temperature of the vulcanizer to about the point of vulcanization of the rubber compound. A means is available for regulating the flow of electric current, and a thermometer is also provided for the purpose of reading the temperature at any time during the process of vulcanization. It is desirable to avoid having the temperature crawl up too high, and the repairman should watch out for this. The thermometer should be a "corrected" one, that is to say, it should be one that has been tested to make sure that it will read off the true temperature within very narrow limits.

For this class of work there are certain tools that will be of excellent service, and the wisest way to purchase an outfit is to include the tools. Fig. 2 shows just such a set of tools, and the vulcanizer with tools complete may be had with a sufficiency of detailed instructions to enable an automobilist of no great skill to do a good job the first time. The illustrations are of the vulcanizer made by James L. Gibney & Bro., New York City and Philadelphia, Pa.

Coming Events

CALENDAR OF FUTURE HAPPENINGS IN THE AUTOMOBILE WORLD THAT WILL HELP THE READER KEEP HIS DATES STRAIGHT—SHOWS, RACES, HILL-CLIMBS, ETC.

Nov. 19-26.......Oakland, Cal., Idora Park Show, Under Management of Oakland Automobile Dealers' Association.
Dec. 1...........Chicago, Ill., First Annual Aeronautical Exhibition in the Coliseum.
Dec. 31-Jan. 7, '11.New York City, Grand Central Palace, Eleventh Annual International Automobile Show.
Jan. 7-14, 1911...New York City, Madison Square Garden, Eleventh Annual Show, Pleasure Car Division, Association of Licensed Manufacturers.
Jan. 15-21, 1911..Detroit, Wayne Gardens, Detroit Automobile Dealers' Association.
Jan. 16-21, 1911..New York City, Madison Spuare Garden, Eleventh Annual Show, Commercial Division, A. L. A. M.
Jan. 28-Feb. 4,'11.Chicago Coliseum, Tenth Annual National Automobile Show Under the Auspices of the National Association of Automobile Manufacturers, Inc., Pleasure Cars and Accessories, Exclusively.
Feb. 6-Feb. 11,'11.Chicago Coliseum, Tenth National Automobile Show Under the Auspices of the National Association of Automobile Manufacturers, Inc., Commercial Vehicles, Pleasure Cars, Motorcycles and Accessories.
Mch. 4-11, 1911...Boston, Mechanics' Building, Ninth Annual Show, Licensed Automobile Dealers' Association.

Races, Hill-Climbs, Etc.

Oct. 22-30........Belmont Park, New York, International Aviation Tournament and Show of Licensed Automobile Dealers of New York City.
Oct. 27-29........Dallas, Tex., Track Meet.
Oct. 28-29........New York City, New York "American's" Motor Truck Contest.
Nov. 3-5..........Atlanta, Ga., Speedway Meet, Atlanta A. A.
Nov. 5-6..........New Orleans, La., Track Meet.
Nov. 5-7..........Los Angeles-Phœnix Road Race, Maricopa Automobile Club.
Nov. 7-11.........Five-day Reliability Run of Chicago Motor Club, 200 Miles a Day.
Nov. 10-12-13.....San Antonio, Tex., Track Meet.
Nov. 11-12........Savannah, Ga., Road Race, Savannah Automobile Club, and Grand Prix, Automobile Club of America.
Nov. 24...........Santa Monica Road Race, Los Angeles, Cal.
Nov. 26-27........Los Angeles, Cal., Track Meet, Motordrome.
Dec. 25-26........Los Angeles, Cal., 24-Hour Race, Motordrome.

THE AUTOMOBILE

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NOW that the first cost of automobiles is reduced to a stable and satisfactory level, concomitant with an increasing quality that eliminates speculation bearing upon the cost of maintenance from the purely mechanical point of view, it remains to discuss the phases of maintenance cost, such as will ultimately better the situation, thereby bringing the automobile well within the reach of the man who has no hesitancy in paying the first cost, but who might be dragged down by an undue expense account following the operation of the car. A casual inspection of the customary items of maintenance will show that fuel and lubricating oil are within reason, although it is to be expected that something can be done to trim these items down, partly by harmonizing the relations of the power plant to the chassis, and to quite an extent, when users learn to be moderate, paying some attention to the road conditions, adjusting the speed accordingly.

* * *

THE preponderance of maintenance cost is chargeable to the tires. Automobilists have in this item a serious problem to cope with, and the struggle they are experiencing could scarcely be more effective were they bent upon making the tire bill as large as possible. In the leading article this week in THE AUTOMOBILE the problems of maintenance are taken up broadly, with the expectation that the whole subject will be treated, taking, perhaps, several weeks. It is there pointed out, among other things, that by actual count the automobiles which are driven by chauffeurs are subjected to tire abuse by the wholesale, and it does seem strange that owners of automobiles will pay a fat lazy lubber real money for no better purpose than to permit him to collect commissions on the tires which will have to be purchased to replace those that are not given a chance to wear out.

* * *

BUT even the owners who drive their own automobiles stand in their own light, since they fail to grasp the significance of rubber in the structure of pneumatic tires; the popular belief is that this substance is put into tires for the same reason that it is employed in rubber balls, *i. e.*, to make them bounce. This belief is a good even mile distant from the true situation; rubber is used in tires for the same reason that paint is put upon a house. The class of people who labor under the impression that houses are painted to make them look well belong in the same category as the man who accepts the rubber ball theory. Paint is made up of linseed oil and pigment. The pigment gives body to the oil, preventing it from streaking. It is not out of place to employ artistic colors, since they do not prevent the pigment from doing its work, but the linseed oil, having a close texture and elastic properties, coats over the wood, or rather material, sealing it up tightly, so that oxidation and the ravages of hungry fungus growths will not induce a condition of rapid deterioration. Linseed oil would scarcely serve as a coating for the fabric used in pneumatic tires, but rubber is used instead.

* * *

IN recounting the theory of the pneumatic tire, air is used as the resilient medium, the inner tube being made of rubber compound, the latter being impervious to the seepage of air under pressure, but the rubber itself, being incapable of resisting any great pressure, has to be backed up by something of greater strength. Cotton fabric is employed in the casing because of the resisting qualities of cotton, when it is new; but owing to the rapidity with which mildew and like fungi attack and destroy cotton, just as fungus attacks and destroys wood, a protecting coat of rubber is applied to the layers of cotton, and as long as this coat remains intact mildew is debarred; but if the cotton is exposed at any point its "wick-like" properties are at once brought into play; water is drawn in, and with it come myriads of mildew and like fungi. It remains for automobilists to repair wounds in the rubber coating of tires before mildew sets up its festering influence.

* * *

CONSIDERING the high first cost of pneumatic tires and the rapidity with which they wear out, even when they are well cared for, there is reason enough for encouraging automobilists to avoid the maluse of their cars, and to instruct their chauffeurs to ride in a trolley car, excepting when they are helping the owners to realize value for service. If tires are now being made as well as it is possible to do so, using the best grade of rubber, superior staple, and the utmost skill in the process, it certainly does remain for the automobilist to put his foot down upon all tire abuses, learn what the rubber is for, and take advantage of whatever little value there is in it.

15% Cut in Tires

MANUFACTURERS WILL SLASH PRICES HORIZONTALLY DECEMBER 1, THUS RELIEVING MOTORDOM OF A DAMPER ON THE TRADE CAUSED BY CORNER IN RUBBER MARKET

RUBBER tires, the most puzzling element of motoring, are to be sharply cut in price on December 1. A horizontal slash of 15 per cent. has been decreed and the new order of things will go into effect on that date.

The course of the raw rubber market has followed the inexorable laws of supply and demand and at present is in the neighborhood of $1.40 a pound. When THE AUTOMOBILE last Spring published the facts about the manipulated condition of the rubber market abroad, the price of Para rubber in the open market was over $3 a pound.

It was pointed out that the tire men hesitated to buy under those conditions as the prices paid for raw rubber would have made the price of tires prohibitory and would have exerted a deadening effect upon the automobile trade generally. Then came a conference of the A. L. A. M. at which a decision was reached not to force the tire men to buy in the manipulated market by insisting on entering contracts for their tire supplies.

The article in THE AUTOMOBILE was widely read and was cabled in its entirety to London and the news it contained caused the raw rubber market to waver and then fall about a dollar a pound when the holders of large blocks of rubber realized that they would have to take profits speedily or not at all.

Since then the course of the market has been downward, with a few little strong spurts when isolated manufacturers tried to secure their annual supply. The tire men say that the current level is still too high and no purchases of great importance will be made until they can be executed somewhere about $1.20 a pound.

Even under the improved conditions that have obtained so far this Fall the cost of tires has proved a big obstacle to motoring and the general reduction will be particularly gratifying to the automobile public.

The understanding of the tire men and the makers is still in force and the manufacture of tires has been conducted conservatively. Outside supplies of raw rubber have been called upon rather more extensively than ever before and in the exact measure that the demand has been released from the central rubber market, prices have sagged off.

Tire men are somewhat apprehensive lest the announcement of the cut will have the effect of stiffening the demand for the finished product and have taken precautions not to stimulate the raw rubber market by heavy purchases.

They say that the market is in a nervous condition and shows signs of a "corner" whenever a big buying order is shown.

1911 A. L. A. M.'s Last Show

AUTOMOBILE EXHIBITS IN NEW YORK WILL BE CONDUCTED IN FUTURE BY THE LICENSED DEALERS' ASSOCIATION, BEGINNING WITH 1912

WHEN the doors of Madison Square Garden close upon the automobile show to be conducted by the A. L. A. M. next January, they will have closed upon the last show ever to be held by that organization in New York. In 1912 the display of automobiles in the metropolis will be handled by the licensed dealers' association and the show will be in the same class as that held annually in Boston.

Naturally, such a show will have considerably more weight and volume than the New England show, but it will not be a manufacturers' exhibition. The reasons for this action are two fold. In the first place the holding of a manufacturers' show is an appreciable element of expense that can be taken care of in another way. In the second place, the real reason is that the dealers in motor cars object to a manufacturers' show in their territory. This objection rises not so much from the fact that the makers sell some cars in the dealers' territory as from the tangles that have arisen in the past and are feared in the future in spoiling sales for the dealers.

The situation eliminating the national manufacturers' show will leave the Chicago show as the only simon-pure makers exhibition in the United States.

While plans so far in the future are still rather nebulous, the announcement as above will be received with much favor by the trade.

Johnson Company to Show at Palace

Space to exhibit its line of automobiles, in the Palace show, has been contracted for by the Johnson Service Co., of Milwaukee, Wis., according to statements coming from the company itself. Herbert Longendyke, one of the promoters of the show, entertained the press at luncheon at the Automobile Club of America last Thursday and explained the scope of the show enterprise.

Mr. Longendyke announced that he would establish headquarters at the Palace within a short time and would conduct a vigorous campaign. So far, his visits to New York have been periodical. He has not yet authorized the publication of his list of exhibitors.

San Francisco Auto Show Planned

SAN FRANCISCO, Oct. 3—Plans are now being laid for an automobile show to be held in this city during December or January. Behind the movement is the San Francisco Motor Club. The Coliseum, in which two of the previous shows were held, has been rebuilt, and it is probable that the exhibition will be held in this spacious structure.

The automobile dealers of Oakland are also getting ready for a show. Their exhibition will be held in November, according to the present plans. Most of the large number of cars that are represented in San Francisco also have their agents or sub-agents in Oakland. It is understood that harmony now reigns and that there will be a complete representation in the show.

Little Space Left at the Boston Dealers' Show

Manager Chester I. Campbell of the Boston show has allotted the space to the accessory men, the latter taking nearly all that was left after the Boston dealers had been supplied. There is still a little here and there held as a sort of reserve and from these places some of the applicants among the dealers who were unable to get anything when the allotment was made to agencies and branches will be supplied.

Reeves Addresses Students

GENERAL MANAGER A. L. A. M. TELLS Y. M. C. A. CLASS ABOUT THE OPPORTUNITIES AFFORDED BY THE AUTOMOBILE INDUSTRY TO LIVE MEN

ALFRED REEVES, general manager of the A. L. A. M., was the chief speaker at the exercises held in connection with the opening of the seventh year of the automobile school at the Y. M. C. A. last night. Mr. Reeves' address in part was as follows:

"Ten years ago there were about 3,500 machines in America—now there are 400,000.

"Ten years ago there were 27 factories (200 cars being a record production for any one of them)—now we have almost 100 producing factories, to say nothing of a like number of experimentors, involved in the making of motor cars, while an annual production of 15,000 and even 25,000 cars in one factory is not unusual.

"In a decade the capital of the automobile and accessory makers has increased from approximately $6,200,000 to $450,000,000, of which $275,000,000 is in motor car factories alone.

"Ten years ago the number of persons employed in making automobiles and accessories was estimated at 2,000; now there are 278,000 individuals including those in salesrooms and garages.

"Ten years ago there were probably 800 chauffeurs in New York State, which now boasts of almost 25,000 registered drivers.

"Automobile Row in New York in 1900 showed 14 different makes of cars; now there are 84 for you to select from.

"Ten years ago the average price of cars was $1,100, then it ran up to $2,137 in 1907, after which, with the increase in the number of moderate priced machines, it has come down to $1,545, although the very high-grade cars are selling at even higher prices than they were two years ago.

"When the fundamental patent covering the modern gasoline automobile was issued to George B. Selden in 1895, even the greatest dreamer had no idea of what 1910 would show in the motor car industry, and it has been all the result of work by able men with ideas. Money has had comparatively little to do with it. Although a wealthy man to-day, as a result of his invention, under which 83 manufacturers pay royalties, George B. Selden was a poor man ten years ago. Most of our cars of to-day came not so much from capital as from brains and mechanical genius in men who began at the bottom of the ladder.

"Great credit for the present position of the motor car industry is due those pioneers like Winton, Ford, Haynes, Apperson, Maxwell, Buick, Olds, Duryea, Packard and a dozen others whose names are now household words.

"At the same time, however, I would not take credit from the business men of the industry who have financed the manufacture and marketed the products. They are a mighty important part of the success, for it was the enterprise, the faith in the industry and the ability to manufacture and market on the part of the captains of industry that supplied the world with the concrete and developed ideas of the engineers and mechanical men.

"The future is your problem, however. Are all the chances gone?

"Will automobiles continue to be used?

"How many people can maintain them?

"Will they take the place of the horse?

"What is the best branch of the industry for me to enter?

"These are among the important questions that confront you gentlemen.

"Perfect as our cars appear, with their silent, powerful motors and excellent design and construction, the automobile of ten years hence will show radical changes. The present general design may continue, but think of the improvements that can be made. Improvements in transmission, in greater simplicity and easier control, in increased power and in economy of fuel consumption, to say nothing of the ever increasing need of something to improve, to cheapen or to supplant the pneumatic tire, which, like the perpetual motion problem, has thus far seemed impossible of solution. It is the general opinion that the pneumatic tire will always be with us except for very heavy vehicles, and while greatly improved in the past few years, it offers a fine opportunity for betterment.

"Now as to the use of motor cars. They are certain to increase in number, solely on account of their utility, without regard to pleasure use. Every farmer needs one, and the Government reports show more than 5,000,000 farms in this country. We know that every doctor must have one and there are 7,700 in New York City alone, and 140,000 in the country.

"Every contractor, every suburban real estate agent, and if the truth be really told, every man, if not an owner now, hopes at some time to operate his own motor car.

"Constantly decreasing maintenance expense is making it possible for more and more people to own machines, even if for pleasure use alone. Moreover, in this great country of ours there are 997,000 families with an annual income of $3,000 or more. It is believed that America will continue to buy annually 200,000 motor cars of all types, approximately that number having been sold during the past twelve months.

"Naturally the greatest field for motors in the future is for the freight carrying vehicle, which offers the solution of those many problems involved in our present wasteful method of transferring merchandise by horse-drawn vehicles.

"Using a motor car which will carry twice the load, at twice the speed, and requiring only half the space, will be like increasing the width of our streets six times. It must always be borne in mind that there are at present 7,000,000 horse-drawn vehicles in use in this country, and an average of 900,000 horse-drawn vehicles being made every year, almost all of which must be supplanted by motor cars.

"The industry, new as it is, requires new men. Some of those in it now have lived on the overflow, simply because no better men were obtainable. Many salesmen in our local trade know little or nothing about the cars they sell. There are scores of chauffeurs in New York who should be in jail instead of driving motor cars. They should bar from driving those men, owners or chauffeurs, who run with mufflers open, that whirl round corners, hog the center of the road, and disregard pedestrians (of whom there are still a few).

"Those makers who turn out badly designed cars, those promoters who would sell you stock in an automobile company on the promise that you will get rich over night are passing and the automobile industry is on a more substantial foundation than ever before.

"The 83 factories in the Association which I have the honor to represent are looking for men of ideas. Opportunities are coming up every day. The reward is not alone money, but a stnading in the business world; a reputation for your friends and family to be proud of, and the always enjoyable sensation of having accomplished something worth while. Energetic and loyal work in the automobile industry assures a future for every man here to-night. The business, with its almost unlimited field, is one of the most substantial in America, and the rantings of dyspeptic pessimists who have viewed its rapid strides with alarm cannot halt its growth in this blessed country where every man has the opportunity to prove his worth and to receive the just reward of his efforts."

Detroit Motor News

STEAM NAVIGATION COMPANY PREPARES TO EMBARK IN TRANSPORTATION THROUGH AIR—OWEN MERGER CONFORMED—FORD TO INVADE NEW YORK

DETROIT, Oct. 24—Anticipating the time when aerial navigation will to some extent supplant the means of travel now in vogue, the Detroit & Cleveland Aerial Navigation Co., of Detroit, has been incorporated, with a nominal capital stock of $50,000. The new organization, which by the way, so far as can be learned, is the first company to be chartered for carrying passengers through the air, is made up of stockholders in the Detroit & Cleveland Navigation Co., and is much more far-reaching than the name would indicate. The company operates side-wheel passenger fleets between Detroit, Cleveland, Buffalo and Mackinac, and it is the intention as soon as aerial navigation has been rendered practical to supplement this service with a full line of airships for the accommodation of those desirous of traveling in that manner.

"We will not do any experimenting," says Vice-President and General Manager A. A. Schantz. "Our business is purely transporting passengers and freight. The minute airships become sufficiently practical we will add service of this nature. The capital stock mentioned in our articles of incorporation is merely nominal, and will be increased when the occasion requires. Personally I believe it will be a long time before any man succeeds in crossing the ocean in an airship of any sort. But with the rapid advancement in the development of aeroplanes there is no reason that I can see why flights of two or three hundred miles should not be common within a few years, at the most. When that time arrives we want to be prepared for it."

Details have been completed for the taking over of the Owen Motor Car Company, of this city, by the Reo Company, of Lansing, as announced in THE AUTOMOBILE. Holders of Owen stock will receive stock in the Reo Company on an equitable basis, and some of the Owen officers will be given executive positions in Lansing. All the equipment and stock in the Detroit plant is being removed to Lansing, and the Reo will be managed on a more comprehensive scale than the rather limited manner in which affairs had been conducted since its organization.

The Ford Motor Company is to invade New York in a manufacturing way, announcement being made of the purchase of a tract of land at Jackson and Honeywell avenues, Long Island City, upon which a four-story concrete structure, 75 x 265 feet will be erected. This building will be equipped with every manufacturing facility, and will be at the disposal of dealers and sub-dealers in the vicinity of New York who handle Ford cars, and their customers. There will also be a fine display room and convention hall for branch managers of the Atlantic seaboard. It is the intention to have this factory ready for business by the middle of March.

Atlanta Speedway Meet

MORE THAN HALF A HUNDRED CARS ENTERED FOR THE SECOND ANNUAL FALL MEETING—PUTTING THE TRACK IN SHAPE

ATLANTA, GA., Oct. 24—One week from next Thursday afternoon, on the Atlanta Speedway, the second annual fall meeting of the Atlanta Automobile Association will get under way, with fifty or more cars taking part. Ten days before the meet forty-seven were entered and a half dozen promised.

As most of these machines are strictly stock chassis affairs this race meet should be the best stock chassis event ever held here.

The Atlanta association will give away nearly $12,000 to the cars that take part and there should be enough entries in every event to make it exceptionally interesting. The list follows:

Thursday, November 3.—Time trials, free-for-all, 1 mile; 161-230 cubic inches, 12 miles; free-for-all, 20 miles; 231-300, 10 miles; free-for-all, Southern amateur championship, 10 miles; free-for-all, 10 miles; 451-600, 20 miles; Coca Cola trophy, 301-450, 100 miles.

Friday, November 4.—161-230 cubic inches, 10 miles; free-for-all, 10 miles; 231-300 cubic inches, 12 miles; free-for-all, 20 miles; 301-450 cubic inches, 14 miles; amateur free-for-all, 20 miles; free-for-all handicap, 10 miles; City of Atlanta trophy, 451-600 cubic inches, 200 miles.

Saturday, Nov. 5.—Event 18, Australian pursuit race; event 19, amateur free-for-all, 20 miles; event 20, Atlanta Speedway Grand Prize race, free-for-all, 250 miles.

The entries to date include: E-M-F, 2; Fiat "60"; Pope-Hartford, 3; Cole "30," 2; Cole 1911; National "60"; National "40," 2; Falcar, 3; Staver, 3; Knox "60"; Benz "200"; Darracq; Lozier "40"; Westcott; Parry, 2; Firestone-Columbus, 3; Renault; MacFarlan, 2; Halladay; Lozier; Simplex, 2; Marmon, 5; Stearns; Abbott-Detroit, 2; Marquette-Buick.

Ironing out and oiling Atlanta speedway for the fall meeting

Filling the soft spots and making the surface hard and level

Flyers Breaking Records

ENTRANTS AT BELMONT PARK INTERNATIONAL AVIATION TOURNAMENT GIVE EXCELLENT DEMONSTRATION OF AEROPLANES' STATUS

WITHOUT doubt the first international aviation meet on American soil, which is now being held at Belmont Park, L. I., has proved an immense success so far as it has progressed. The tournament opened last Saturday and will continue through next Sunday. Air experts from all the nations that have made considerable progress in the art of flying are present.

Saturday was very cloudy and foggy and the exhibition was not markedly unique save for the atmosphere of mystery that was cast about by the heavy air.

Sunday had been too windy for safe flight, and when the breeze died down to 15 miles an hour and held steady, the crowds poured out to see the flights.

At one time during the hourly distance race, there were ten aeroplanes circling the course.

Some very high speed was made. Aubrun in a Bleriot turned one round of the course at the rate of 62 miles an hour and his performance was equalled by the Antoinette, a giant monoplane, driven by Latham. J. Armstrong Drexel in a Bleriot mounted to the height of 7105 feet.

Tuesday was another favorable day for flying and the spectacle of the preceding day was repeated. On Thursday the flight from the course to and around the Statue of Liberty will be tried, weather permitting.

As a sporting event, one of the Monday races was delightful. Grahame-White in a Farman and Ralph Johnstone in a Wright were leading neck and neck until within two minutes of the conclusion of the hour, with Aubrun and Drexel in Bleriots and Latham in the Antoinette trailing. Suddenly the crowd noticed that the monoplane division was closing on the biplanes and entering the final round, the five flyers were bunched. Flying high, the Antoinette shot ahead, making the last turn with the Farman second and Aubrun's Bleriot, third. It was a finish like that of an automobile cup race or a fierce drive of thoroughbred horses as far as interest was concerned.

The patronage of the tournament has been excellent. Following is a summary of the events:

Saturday

First Hourly Distance: Grahame-White (Farman), 30 m.; 51:44 1-5.
Second Hourly Distance: Grahame-White (Farman), 30 m.; 59:23 1-5.
First Hourly Altitude: Hoxsey (Wright), 742 feet.
Second Hourly Altitude: Hoxsey (Wright), 673 feet.
Totalization of distance: Grahame-White, 2 hours; Moisant, 1:42:10 4-5; Drexel, 19:41 4-5; Hoxsey, 8:05 2-5.
Cross-Country: Moisant, 20 miles, 39:41 4-5.

Sunday (weather prevented flights)

View from Grand Stand at Belmont Park Aviation Meet

Monday

First Hourly Distance: Drexel (Bleriot), 42 miles; 54:33 3-5.
Second Hourly Distance: Latham (Antoinette), 31 1-2, 48:41 4-5.
First Hourly Altitude: Drexel (Bleriot), 5,615 feet.
Second Hourly Altitude: Drexel (Bleriot), 7,105 feet.
Speed Contest: McCurdy (Curtiss), ten laps in 19:49 1-5.
Daily total of duration: Hoxsey, 1:57:13 1-5; Grahame-White, 1:55:17 4-5; Johnstone, 1:49:28 2-5.

Tuesday

First Hourly Distance: Latham, 28 1-2 miles in 54:36 4-5.
Second Hourly Distance: Grahame-White, 21 miles in 34:16 4-5.
First Hourly Altitude: De Lesseps, 6,391 feet.
Second Hourly Altitude: Johnstone, 7,303 feet.
Cross-Country: Radley, 20 miles; 19:48 4-5.
Total of duration: Hoxsey and Johnstone, 2 hours; Latham, 1 hour.

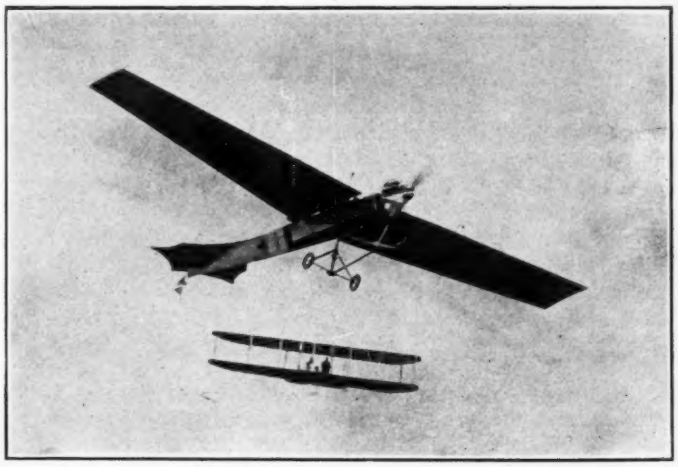
Auto Show Attracts Much Attention

While the aircraft center attention out-doors at the Belmont Park Tournament, the big betting ring under the grandstand is the scene of an attractive display of automobiles and accessories. On the right in coming from the track is the exhibit of the Peerless Motor Car Co. Two handsome limousines are shown. They are of 1911 model and represent in appearance the height of motor luxury.

Next to the Peerless is the exhibit of the Cadillac Motor Car Co. Three 1911 models are shown—a demi-tonneau, touring car and limousine. This exhibit is the most complete and comprehensive at the show and is constantly attended.

The Cole "30" is stationed next in line, showing a close-coupled car and a torpedo speedster. Prominent in this exhibit is the Massapequa Trophy which was won October 1 on the Vanderbilt Cup course by a Cole.

The Mitchell-Lewis Motor Co. shows a Mitchell equipped with a demi-tonneau of graceful lines and business-like appearance.



Latham in Antoinette and Johnson in Wright

Next in line is a Stevens-Duryea limousine.

A Chalmers demi-tonneau completes the show on the west side of the ring.

Across the main aisle is the exhibit of the West Side Y. M. C. A. school. This includes a Lozier engine in operation.

The American Propeller Co., showing a line of aero propellers, is next to the left and then come the booths of the Hartford and Goodyear tire companies, showing aero tires chifly.

The exhibit of Marburg Brothers is popular. The line on show is the Mea magneto, S. R. O. bearings and Duralumin, an alloyed aluminum which has several of the properties of steel and which is said to be important as to the future development of the aeroplane.

The Bosch Magneto has the next booth with its well-known line.

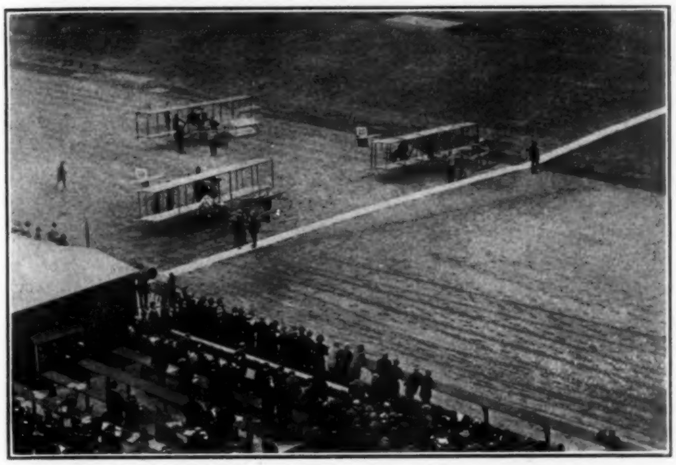
Peter A. Frasse & Co. show steel tubing and cast and turned balls for bearings.

Bliven & Carrington exhibit motor greases, steel bases and the Poldhuite line.

John A. Roebling's Sons Co. shows bare and insulated cables of all sorts, wire cloths, and drop-forged tools.

The Aerial Navigation Company exhibits a line of propellers. The Simms Magneto, Century Rubber, Livingston Radiator, showing radiators, and Booth Demountable Rims, fill up the space to the section devoted to the Aerial Equipment Co., which is showing the Anzani motor.

In the middle of the big inclosure the Metz Co., of Waltham, Mass., has the most prominent station. Two Metz automobiles are shown, a runabout and the other a special delivery package car, equipped with a drum-like receptacle for carrying packages.



Start of One-hour Flight at Belmont Park Aviation Meet

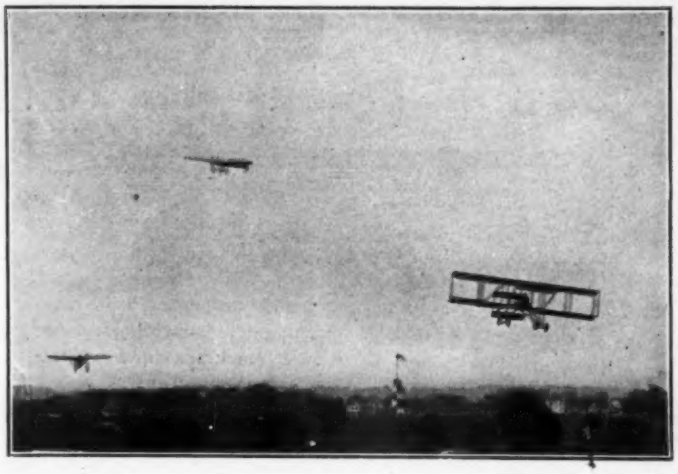
The cars have two 3.5 bore cylinders. The company also shows a completely equipped monoplane.

Alongside the Metz exhibit is that of the "Ever Ready" automatic motor starter. This device is shown in action attached to an automobile. Pressure on a pedal from the driver's seat spins the engine and starts the car. The device is attached at the lower end of the radiator, secured to the crankshaft and supported upon a metal bracket. It appears like an inverted headlight and is cased in brass. The device is composed of two springs which are wound up in the first place by hand, but after the first winding, the motor itself takes care of that part of its operation. The springs are released by a trigger that is worked by the pedal. The starter is shown by the Auto Improvement Co.

The Stewart Automobile Academy completes the list of exhibitors.

Aeroplane Stresses Not Yet to Be Calculated

In view of recent fatalities and near-fatalities as well as the unimpressive ending of the aeroplane race from Chicago to New York, a technical contemporary has issued a warning to airmen coupled with the advice to go about the construction of aeroplanes armed with a full complement of stress sheets, and the daily press, in some instances, speeds the advice as sound and needful. The stress calculations used for bridge construction should be taken as a model, according to this advice, and it is the opinion of the esteemed contemporaries that many fatal accidents of the air will be averted if the advice is followed. By inference it is suggested that improved stability and equilibrium, greater reliabilty of motor power and increased efficiency in the application of power against the atmosphere are less urgently needed than stress sheets. In this connection it



Grahame-White in foreground and the Antoinette highest in the air

may be worth remembering that the load and wind stresses in bridges are calculated with a view to a very large factor of safety in the actual construction, that they relate to materials of well-established properties, that neither rapid motion nor elastic reaction nor violent shocks affecting the whole structure as a unit are of primary interest in bridges and that, despite all these elements in favor of stress calculation as against empiric data, bridges are not infrequently found to be deficient, as witness the accident to the Quebec bridge during its construction and the reinforcements which it was deemed necessary to incorporate in the Blackwell Island bridge connecting New York city with Brooklyn. Some comical incidents of the automobile industry also throw light on the subject. A prominent Belgian engineer, quite scientific, conceived the idea that stress sheets were the first requirements for making an automobile "stand up" in the days when automobiles generally didn't. The car he produced weighed about seven times as much as other cars and, while hard to move with much speed, managed to pound itself to pieces. A scientist of New York city started on the same lines, but before he and his staff were through calculating the empiric world had produced a car that was good enough for him. Even to-day many of the formulas employed for calculating dimensions for automobile parts have at some point in the chain of mathematics upon which they are founded a factor representing average dimensions of the corresponding part in a number of different and reputable automobiles, and this factor, almost needless to say, is essentially empiric as well as empirically essential. To find a substitute for this factor in the construction of aeroplanes would at the present moment be impossible for want of suitable examples for imitation The aeroplane constructor will have to do as the automobile constructor did; that is, devise a use of materials for which there is no exactly parallel precedent, while applying as best he may those after all not very complicated laws of mechanics upon which all stress calculations will be based, as soon as a sufficient mass of data shall have been gathered.

A really fundamental difficulty about the working out and applying of stress sheets lies furthermore in the very contrary, almost cantankerous fact that the stresses to which an aeroplane is subject in flight depend wholly upon the action of air against surfaces, and the action of air against surfaces constitutes in itself the whole question of aeroplane construction. If it were understood well enough for admitting the calculation of stresses, such knowledge would be applied first of all to the improvement of the surfaces by which stress is brought to bear against the air for the purposes of sustentation; it would be applied for the improvement of the propeller by which stress is brought to bear against the atmosphere for purposes of propulsion, and it would be applied to all the neutral parts in order to reduce the stress of the air resistance which they encounter.

Boston Trucks in Contest

THIRTY-FIVE COMMERCIAL GASOLINE VEHICLES TAKE PART IN ROAD RUN FROM BOSTON—120 MILES UNDER SERVICE CONDITIONS

BOSTON, Oct. 22—After two days of running, covering a distance of approximately 120 miles, the different trucks entered in the Boston *American's* contest reached the Back Bay late this afternoon and were checked in. It proved quite a success, all things considered. The caravan of trucks and official cars that made the trip from Boston to Newburyport and return numbered about 50 and as the machines passed through the different cities they attracted a lot of attention.

The first day's run was 58 miles to Newburyport by way of Lowell and Haverhill. At these places checking stations were established and this allowed the trucks to be inspected. It was the same story on the return trip of 62 miles through Gloucester, Salem, Lynn, etc.

The trucks were divided into five classes according to their capacity and a sixth division was added for private owners. All the classes filled pretty well considering that it was not a club affair. The machines were started off from Boston by Mayor Fitzgerald at nine Friday morning with the heavy trucks getting the right of way. They were allowed a speed of six miles an hour. The others were given varying time limits according to loads and capacity. On the return it was found that the big trucks did so well that a speed of eight miles an hour might be made without trouble and so this was ordered. It was an instructive object lesson in commercial vehicle transportation to watch the machines touring along carrying loads of furniture, wire, coal, lumber, flour and a lot of other such stuff on the long hauls.

One of the gasoline stations in Boston commercial run

Many of the Boston dealers took a hand in it to help make the run a success by doing the official work and loaning cars to convey interested persons.

One of the most notable features of the test was the few accidents to the trucks entered in the run. In each instance where accidents happened there was not an occasion when the trucks meeting with mishaps could have been found at fault in any way. The first truck in trouble was a five-ton Reliance which when entering Billerica, on the first day's run, skidded while passing through a bed of soft sand and was ditched. The truck was disabled to an extent that the repairs necessary to continue could not have been made.

The Johnson truck was next to meet with an accident which was brought about by the slippery street car rails on which the truck skidded and smashed into a telegraph pole. The force of the impact was so great that both of the front wheels of the truck were demolished.

The final awards will not be made until the cost of operation has been computed. Following is the record of the test:

CLASS A

3 Hart Kraft, clean.	20 Metz, withdrawn.
11 Warren Detroit, clean.	44 Reliance, 164 points.
18 Metz, 10 points.	47 I. H. C., clean.
19 Metz, 38 points.	

CLASS B

4 Atterbury, clean.	10 McIntyre, withdrawn.
5 Gramme, withdrawn.	13 Franklin, clean.
2 Rapid, clean.	23 Victor, clean.
8 Rapid, clean.	30 Randolph, withdrawn.
9 McIntyre, clean.	21 Wilcox, clean.

CLASS C

28 Garford, clean.	30 Alco, clean.
29 Garford, clean.	34 Frayer-Miller, 6 points.

CLASS D

6 Knox, clean.	35 Johnson, clean.
32 Frayer-Miller, clean.	36 Johnson, withdrawn.
33 Frayer-Miller, clean.	

CLASS E

24 Sampson, clean.	48 Reliance, withdrawn.
26 Morgan, clean.	

PRIVATE OWNERS

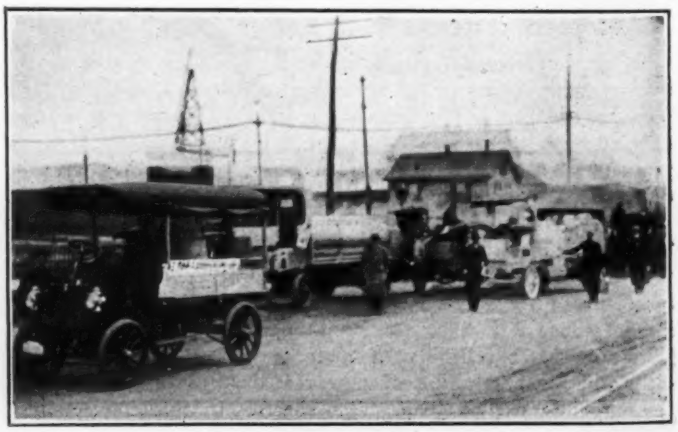
17 Rapid, clean.	41 Autocar, clean.
1 Autocar, clean.	43 Frayer-Miller, clean.
40 Gramme, clean.	49 Mack, clean.

Many Penalties in Washington Reliability

WASHINGTON, D. C., Oct. 25—At the end of the fourth day of the Washington *Post* run from Washington to Richmond and return the score stood as follows: No. 5 Washington, clean; No. 11 Parry, 1 point; No. 6 Washington, 2 points; No. 9 Maxwell, 3 points; No. 8 Maxwell, 8 points; No. 14 Buick, 9 points; No. 7 Columbia, 22 points; No. 3 Buick, 64 points, and No. 12 Washington, 928 points. The most serious accident of the first day was sustained by Griffin Halstead's Washington car. While negotiating a rough piece of road near Purcellville the car dropped into a hole, breaking the front axle. He telephoned to Washington for a new axle and expects to check out in the morning. Arrison's Washington car was close behind Halstead and in endeavoring to avoid hitting it, Arrison stalled his motor, and suffered a loss of one point. Mortimer's Buick "10" had trouble with a loose oil sight feed and lost five points, while the Buick "Bug" lost one point for similar trouble.

Upon arrival at Washington it was announced that there were no remaining clean scores.

A Buick "17," with Willis Cronkite at the wheel, is acting as pilot car, while a Washington, driven by H. F. Baughmann, serves as the referee's car.



Contestants lining up at a control

Twenty-one Enter Grand Prize

LIST, NOT YET COMPLETE, IS IMPRESSIVE, AND EXPERT SAYS AMERICAN ROAD RECORD WILL BE BROKEN IN

SAVANNAH, Oct. 24—The course over which the Grand Prize race for the international trophy of the Automobile Club of America will be run November 12 will be 17.2 miles long. This shortening of the route was effected by cutting off the Thunderbolt Road protuberance, thus leaving the course in the shape of a rough quadrilateral, with two stretches of practically straight, flat, superlatively smooth roadway, five and eight miles in length. Massage work on the course is being prosecuted by 250 men and already it appears to be in almost perfect condition, some of the cracks who have been over it recently predicting a general shattering of records next month.

The actual list of paid-up entrants includes two Marquette-Buicks, two Marmons, three Fiats, three Benz cars, one Roebling-Planche. two Loziers, the double Vanderbilt Cup winner, the black Alco, three Nationals, Simplex, two Lorraine-De Dietrichs, and a Renault.

To date the entry list for the two light car events to be run off November 11 includes three Falcars, one Marmon, one Marquette-Brick, three Maxwells, two Coles, two Abbott-Detroits and two Cartercars.

In writing exclusively to THE AUTOMOBILE, C. A. Emise, of the Lozier Co., says:

"I went over the course yesterday with Mulford and he did not hesitate to say that it was the best ever laid out on American soil. He expressed the opinion that the American road racing record would be broken and that the possibility existed that the world's mark would be set at a new level. Our car can average better than 70 miles an hour on this course and if that is good enough to win, we will be there or thereabouts.

"There are only three turns that have to be taken at less than 50 miles an hour and the surface is lightning fast throughout. The Ferguson avenue boulevard, some seven miles straightaway, will give an opportunity for the big racing machines to let themselves out to the extreme limit of motor car speed.

"Mulford figures that if the Lozier can do in excess of 70 miles an hour the special racing machines ought to do better. if they stand up. He looks for some of the rounds to be made at the rate of 90 miles an hour.

"In 1908 the course was practically new and, as every one who was here remembers, the surface was perfect. Since then two years have elapsed and the roads have had a chance to settle. The traffic has never been heavy and when the racers start the course will be marvelously fast.

"The Savannah Automobile Club is taking hold of the work of preparation with its accustomed vim and energy."

Group of officials at a checking station—Boston truck run

Entries Stream in for "American's" Truck Test

Following is the list of entries in the New York *American's* Commercial vehicle contest, to be run next Friday and Saturday:

GASOLINE TRUCKS. Div. 1—1,000 lbs. and less

Entrant	Truck	Capacity, lbs.
Hart-Kraft Motor Co.	Hart-Kraft	1,000
Veerac Sales Co.	Veerac	1,000
Chase Motor Truck Co.	Chase	1,000
Hadfield Company	Hatfield	1,000
Hadfield Company	Hatfield	1,000
John Moore & Co.	Brush	600
John Moore & Co.	Brush	600

Division 2—1,001 to 3,000 lbs.

Victor Motor Truck Co.	Victor	3,000
Ladue Carmer Co.	Atterbury	3,000
John Wanamaker	Autocar	2,000
Commercial Maintenance Co.	Grabowsky	2,000
Motor Car Maintenance Co.	Grabowsky	2,000
Grabowsky Power Wagon Co.	Grabowsky	2,000
Torbensen Motor Car Co.	Torbensen	2,000
Cass Motor Truck Co.	Cass	2,000
Flanagan Motor Car Co.	Monitor	2,000
Alden Sampson Mfg. Co.	Alden Sampson	1,500
Chase Motor Truck Co.	Chase	1,500

Johnson clean score truck, No. 35, in Boston commercial run

Division 3—3,001 to 5,000 lbs.

Walter Auto Truck Mfg. Co.	Walter	4,000
Kelly Motor Truck Co.	Kelly	5,000
Renault Frères Selling Branch	Renault	3,500

Division 4—5,001 to 8,000 lbs.

Schleicher Motor Vehicle Co.	Schleicher	6,000
Knox Automobile Co.	Knox	8,000
Alden Sampson Mfg. Co.	Alden Sampson	8,000
W. A. Wood Auto Mfg. Co.	Commer Car	8,000
Standard Gas & Electric Power Co.	Standard	8,000
Carlson Motor & Truck Co.	Carlson	6,000
General Acoustic Co.	British Atlas	6,000
Kelly Motor Truck Co.	Kelly	7,000
Motor Car Maintenance Co.	Grabowsky	6,000
American Locomotive Co.	Alco	6,000
Walter Auto Truck Mfg. Co.	Walter	6,000

Division 5—10,000 lb. and Over

Metzger Motor Car Co.	Hewitt	20,000
Benz Auto Import Co.	Gaggenau	14,000
R. L. Morgan Co.	Morgan	10,000
Alden Sampson Mfg. Co.	Alden Sampson	10,000

ELECTRIC TRUCKS

Abraham & Straus	Lansden	2,000
General Electric Co.	General Vehicle Co.	2,000
General Vehicle Co.	General Vehicle Co.	3,000
P. Daussa & Co.	General Vehicle Co.	6,000
General Vehicle Co.	General Vehicle Co.	1,000
General Vehicle Co.	General Vehicle Co.	2,000
General Vehicle Co.	General Vehicle Co.	4,000
General Vehicle Co.	General Vehicle Co.	7,000
General Vehicle Co.	General Vehicle Co.	10,000
The Lansden Co.	Lansden	3,000
The Lansden Co.	Lansden	3,000
R. H. Macy & Co.	Lansden	2,000
John Wanamaker	Commer Car	2,000
Edison Co. of Brooklyn	General Vehicle Co.	10,000
Central Brewing Co.	General Vehicle Co.	10,000
Central Brewing Co.	General Vehicle Co.	6,000
Borden Condensed Milk Co.	General Vehicle Co.	7,000
Alex D. Shaw	General Vehicle Co.	7,000
Apmann & Meyer	General Vehicle Co.	2,000
Edison Brooklyn Co.	Auto Maintenance Co.	3,000

Automobile Notes at Hoosier Capital

INDIANAPOLIS, IND., Oct. 24—The Circuit Court has held invalid the ordinance requiring all drivers of automobiles and riders of motorcycles to register with the Board of Public Safety and pay a license fee of $1. There have been 4,224 licenses issued under the ordinance, and it is improbable the fees collected will be returned as they were not paid under protest. Objection was raised to the ordinance because it required no qualifications to obtain license, yet left it to the discretion of the board to issue or decline to issue licenses. Objection was also raised to the feature permitting the police judge to revoke licenses for violation of any automobile law or ordinance.

About 200 automobiles were in the industrial parade given by the Indianapolis Trade Association last Tuesday night, eighty-eight of the number being automobile trucks carrying special exhibits of manufacturers and wholesalers of the city. The exhibits of the automobile concerns were elaborate, many having 1911 models in line. The Willys-Overland Company had a special display representing the evolution of transportation. This consisted of an Indian drag, a horse-drawn vehicle and an automobile. The Waverley company, among other things, displayed a coupé on a brilliantly illuminated and beautifully decorated electric truck. The parade was seven miles long, 179 business concerns participating.

The Cole Motor Car Company has recently increased its capital and will build approximately 2,000 cars next season.

Two New Michigan Companies Formed

DETROIT, Oct. 24.—From Lansing comes the announcement of the formation there of a million dollar company which will manufacture motor trucks designed under the direction of R. E. Olds, president of the Reo Motor Car Company.

The Brady-Nagel Manufacturing Company has been organized here, and is negotiating with several concerns making automobile parts and doing special machine work, with a view to consolidating them into one big organization. James J. Brady, formerly vice-president and superintendent of the Chalmers Motor Company, is president of the new concern; William J. Nagel, formerly deputy city controller, is secretary and treasurer, and George Henderson, formerly assistant superintendent of the Chalmers plant, is superintendent.

Richmond Auto Club Elects Officers

RICHMOND, VA., Oct. 24.—The Richmond Automobile Club at a recent meeting elected officers as follows: Horace S. Hawes, president; E. C. Pelouze, vice-president; Melville C. Peck, secretary and treasurer. Preston Belvin, W. B. Nelson, Dr. M. D. Hodge, Jr., John B. Swartout and Rufus C. Williams, executive committee.

Six new members were elected: Dr. A. G. Franklin, Dr. H. B. Sanford, Dr. Charles R. Robins, Joseph Sorg, H. W. Rountree and John C. Easley.

Short News of Interest

—W. J. Connell, Boston representative of the Wheeler and Schebler carbureter factory, of Indianapolis, has changed his location to 555 Boylston street.

—The Halladay Motor Car Company, of 1224 South Olive street, Los Angeles, Cal., has just been organized to handle Halladay cars in California.

—The Heaney Automobile Company, of Minneapolis, Minn., northwestern distributors of Halladay cars, have just completed an additional two-story building.

—The Superior Motor Sales Company has been incorporated in St. Louis for $75,000, to effect a reorganization of the recently established business of M. M. Baker & Company, 2007 Locust street.

—Stephen Holt has been appointed Eastern selling representative of the Abbott Motor Company, of Detroit, and will have New York, Pennsylvania, New Jersey and Maryland, with headquarters at Philadelphia.

—Announcement is made of the increase in capital stock of the Phoenix Auto Supply Company, of St. Louis, from $12,000 to $50,000, fully paid. The assets of the company are scheduled at $105,421, the liabilities $44,365.

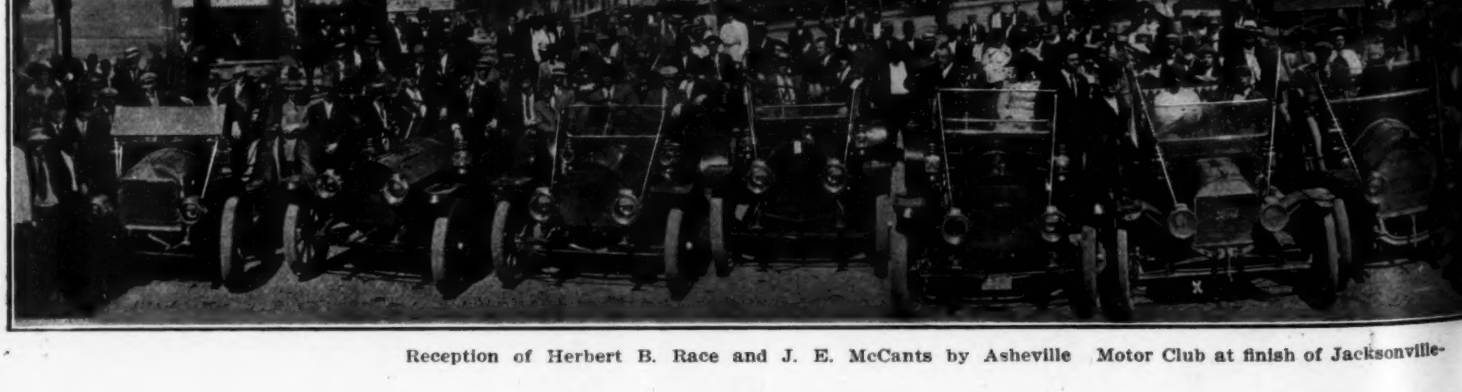
—W. H. Marble, formerly connected with the purchasing department of the Chalmers Motor Company and the Pullman Motor Car Company, has joined the sales force of the Abbott-Detroit Motor Company in the Middle West.

—Berne Nadall, member of the contest board (technical committee) of the A. A. A. and also one of the original Chicago Motor Club (technical committee), has joined forces with the Rayfield carbureter, as special factory representative.

—J. S. Bradfield, for eight years connected with New York and Boston newspapers, is now a member of the salesforce of the Cole "30" in Boston. He was one of the first men in Boston to get the taxi service started through consultations with Police Commissioner O'Meara.

—The Stephenson Motor Car Company, of Milwaukee, Wis., builder of the Utility truck, has opened its new plant at South Milwaukee, which was leased for one year with a three-year option in addition. The plant, formerly occupied by a wrench and tool concern, has been entirely remodeled and a new equipment installed. Thirty to forty men are now being employed. Two types are built, a one-ton car at $2,000 and a three-ton truck at $3,500. George L. Stephenson is president of the company.

—While the principal object of the newly formed Western Automobile Association is to get a broad and speedy highway built between British Columbia and the Northern border of Mexi-



Reception of Herbert B. Race and J. E. McCants by Asheville Motor Club at finish of Jacksonville-

BRIEF ITEMS CULLED HERE AND THERE FOR QUICK READING—INTERESTING ALIKE TO MAKER AND USER

co, it will first take up the improvement of roads in the West, particularly the road between Portland and Seattle. With good roads the trip between Seattle and Portland would be an ideal twelve hours' drive.

—The usual Fall shifts are taking place in Atlanta's automobile colony. The Henderson Motor Co. of Atlanta has opened headquarters to sell Cole and Westcott cars. F. J. Long, formerly of the Olds-Oakland Co., has taken charge as manager. The Warren Motor Car Co. has had a representative in Atlanta looking for some man to take charge of a local agency. The Stearns Co. has opened a local branch with John Toole in charge.

—The new plant of the Ford Motor Company in Highland Park, Detroit, has been opened in all its departments. Operations have been conducted there on a liberal scale, although much of the work was done in the old Piquette avenue plant while the power house for the new plant was being put in commission. Now the scene has shifted, and henceforth the new plant will be the real center of activity. The plant will employ 4,500 men, and has a daily capacity of 240 complete cars.

—Three additional agencies were opened in Boston during the past few days. I. Ross Lippard, general manager of the Victor Motor Truck Company, of Buffalo, placed an agency for his line with the Curtis-Hawkins Company, handlers of the Speedwell in the Hub. Fisher and Allison, of the Prestolite Company, formed the Empire Motor Car Company to handle the Empire "20" in Massachusetts, with headquarters at 94 Massachusetts avenue, and the Kline agency was opened with salesrooms in the Motor Mart, Park square, with N. L. Rush as manager.

—Arrangements have been made for exhibiting Overland cars at the Paris and London auto shows this winter. S. Krauss, manager of the foreign department of the Willys-Overland Company, has just returned from a trip of 7,000 miles by motor car, through England, France, Germany, Belgium, Holland, Denmark, Norway, Sweden, Russia, Austria and Hungary. He had the distinction of being the first American tourist to take advantage of the Tryptique system. In many sections traversed it was the pioneer invasion of the American car and attracted much attention.

—At the adjourned meeting of the Wisconsin State Automobile Association in Milwaukee the following additional directors were elected: R. D. Gorham, Monroe; J. E. Plum, Manitowoc; P. C. Avery, Milwaukee; C. H. Moore, Oakfield; John W. Tufts, Milwaukee; C. D. Dickinson, Appleton; Emil Schandein, Milwaukee; A. P. Cheek, Baraboo; H. O. Deysonroth, Columbus; Dr. R. W. Edden, Janesville. The board is now made up of 25 members, and each local club is represented.

Will Sell Drop Forgings and Die Castings

Incorporation papers are being put through this week for a large selling company that will handle the entire output and be the sole representative of the Billings & Spencer Company, of Hartford, Conn., large producers of drop forgings and tools, and the E. B. Van Wagner Manufacturing Company, of Syracuse, N. Y. Negotiations are under way with two or three other companies.

The name of the corporation will be Claire L. Barnes & Company, and the capital stock is $30,000. Claire L. Barnes will be president and general manager. The general offices will be in Chicago, with branches in Detroit and New York.

Mr. Barnes remains an official of the Billings & Spencer Company, and will also become an official of the E. B. Van Wagner Manufacturing Company. He was secretary of the Detroit Steel Products Company until he resigned to become sales manager of the Billings & Spencer Company. He is director in the Motor & Accessory Manufacturers' Association.

American Fiat Factory's First Cars

The Fiat Company, of Turin, Italy, has just attained the realization of a project which they had determined upon nearly three years ago, namely, the operation of a factory in the United States for the simultaneous production here of such of its models as are in greatest demand in America.

The demonstrating cars of the 35-horsepower 1911 model will be shown to the public in Turin and in New York at the same relative hour.

Like all Fiat models, this new car is built entirely in the Fiat works, many of the more vital parts, especially those composed of special alloy steels, being furnished by this company's Turin shops. The American factory is at Poughkeepsie, N. Y.

Worcester Club Leases Old Quarters

WORCESTER, MASS., Oct. 24—The governors of the Worcester Automobile Club held a special meeting at their temporary headquarters in the Bay State House, Friday night, and voted in thirty-four new candidates for membership, twenty-nine of which were formerly members of the Hancock Club, which recently voted to merge with the local automobile club.

The plan of taking over the Hancock club house at Lincoln Square, which was talked of by the officers and board of governors of the Worcester Automobile Club, has been dropped and the old quarters re-leased with several more rooms.

The new rooms of the club or the old ones which were destroyed by fire will be completed by the first of the year and will be far superior to the old suite in every way.

Included in the new headquarters will be two dining rooms, two card rooms, ladies' reception room, ladies' dining room, reading room, billiard room, Dutch room, library and office, besides a large general reception room.

Asheville record-breaking run in a Ford car, Sept. 26. Time, 2 1-2 days. (Car indicated at X)

Prominent Automobile Accessories

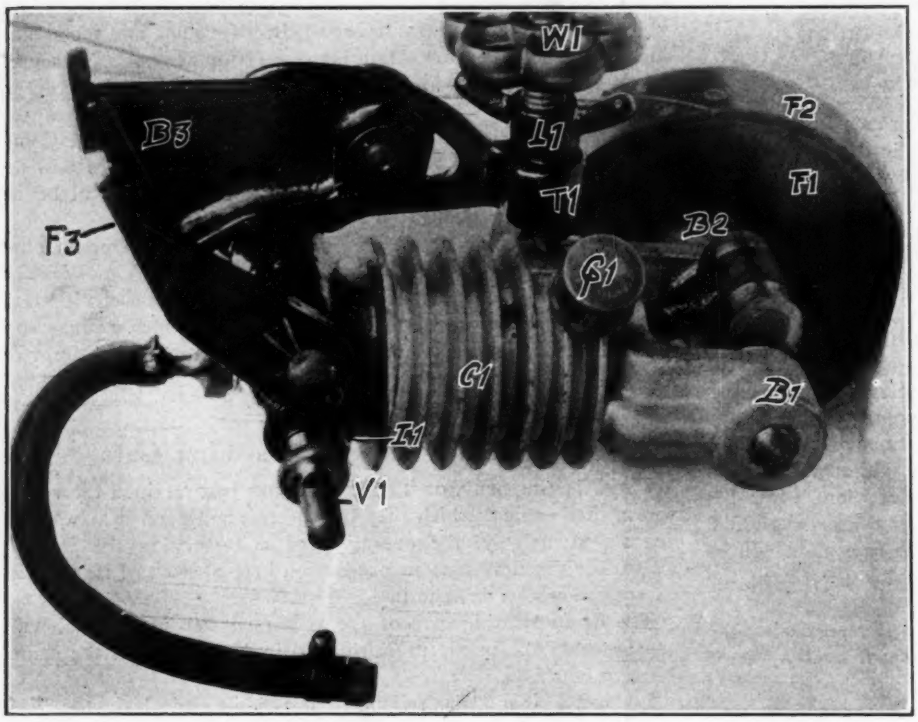


Fig. 1—Tryon tire pump made to take its power from the flywheel of the motor of the automobile and whistle when the tire is inflated

FOR INFLATING AUTOMOBILE TIRES

Next to maintaining tires in good condition, free from open wounds, it is necessary to maintain the tire pressure so high that flexure will be avoided, otherwise the life of the fabric will be reduced below the point of economy, even to the level of the commercially impossible. The tire pump as illustrated in Fig. 1 offers a fine opportunity to keep the tires properly inflated, which is more than can be expected from a motorist on a hot Summer day using a hand pump of no great pretension.

This pump is comprised of a cylinder C1 of cast gray iron, fastened to the bracket B3 of bronze, and air is sucked into the cylinder, due to reciprocation, when the flywheel F1 is brought into contact with the flywheel of the motor, the face F2 of the flywheel F1 being covered with leather, so that the friction will be adequate for the intended purpose when the tightening screw T1 is screwed up by turning on the wheel W1, after which it is locked by the wing-nut L1. The crankshaft rotates in bearings B1 and B2, and the connecting rod C2, of bronze, is provided with liberal bearings at pin and cross head so that the whole structure is substantial and well made.

Fig. 2—A device to register tire pressure

The device is fastened to the chassis frame at a point opposite the flywheel of the motor, and the face F3 of the bracket B3 is wide, and finished accurately, to accommodate itself to the rest it is given on the web of the chassis frame. Air, under proper pressure, leaves the pump through the hose connection C3. When the air is pumped into the tire to be inflated up to the desired pressure, a whistle in the valve V1 makes a shrill sound, warning the automobilist of the fact, and an indicator I1 on the side of the valve V1 tells how much pressure is in the tire. This pump is made by the Tryon Auto Pump Co., with headquarters at 1733 Broadway (Room 205), New York City. Thos. Jacobs is president of the company, and the inventor, E. E. Tryon, is vice-president; Arthur W. Leonard is secretary.

Fig. 3—Signal operated by the exhaust

JERICHO MOTOR CAR SIGNAL

As will be seen from Fig. 3 this instrument or whistle is placed on the outlet of the exhaust pipe and secured to it by a double clamp coupling. Made from aluminum and compact in size, the attachment adds but little extra weight to the car. As all the necessary fittings are supplied, occasional lubrication and cleaning is all that is required. This horn is manufactured by the Randall-Faichney Company, Boston, Mass.

TO SAVE THE HANDS IN WINTER

To prevent the hands from chafing and protect them from the cold in Winter the "Eze-Grip" removable wheel cover (Figs. 4 and 5) should fill a long-felt want. It is considerably more elegant than binding twine round the wheel and in the event of wet can be unlaced and speedily removed. It is made of soft, pliable leather either in black or tan and lined with soft wool felt. It is made by the Hayne Surridge Commission Co., Lucas avenue, St. Louis, Mo.

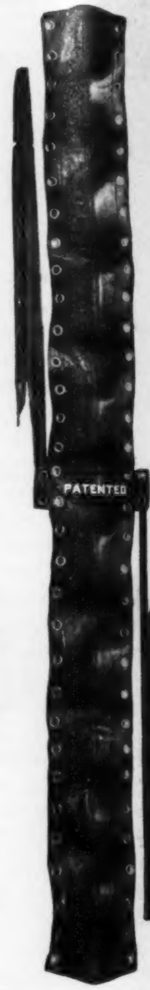


Fig. 4 — "Eze-Grip" unwrapped

PRESSURE REGISTER

The latest tire gauge to be marketed by H. W. Walker, of Syracuse, N. Y., is known as the Walker Tire Pressure Register, No. 2 (Fig. 2). This is a small register, three inches long and designed so as to be easily carried in the vest pocket. This gauge is fully guaranteed to be accurate and reliable by the manufacturer.

Fig. 5—"Eze-Grip" applied to steering wheel